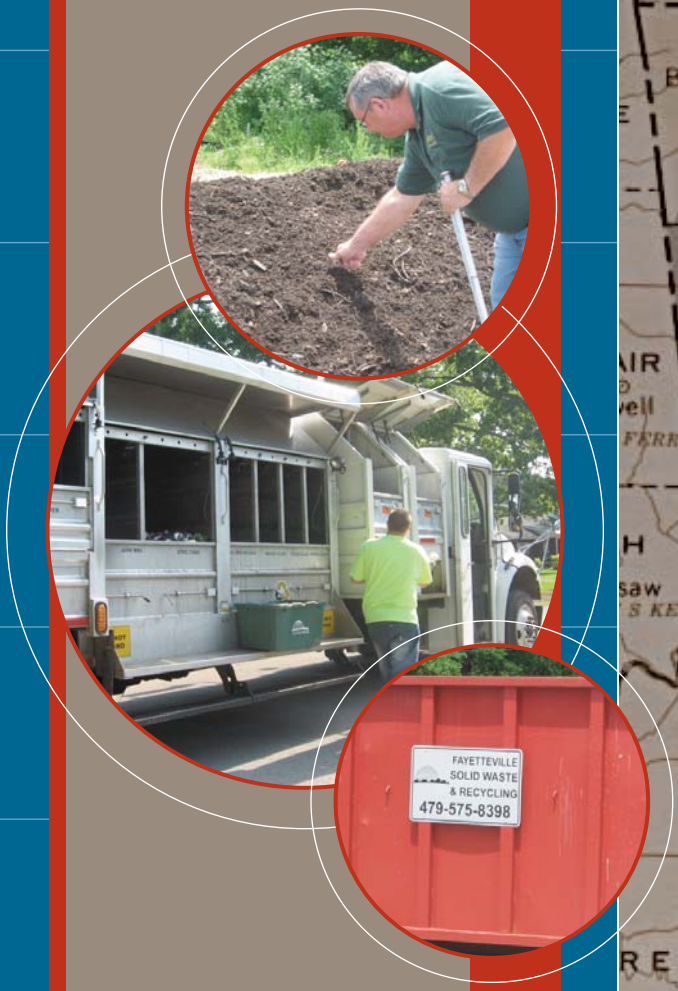

CITY OF FAYETTEVILLE, ARKANSAS

FINAL REPORT

RECYCLING PROGRAM STUDY

APRIL 2009

R·W·BECK

Mind Powered: Insight with Impact.

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Recycling Program Study

City of Fayetteville, Arkansas

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Executive Summary

Introduction

The City of Fayetteville, Arkansas (City) has made a concerted effort to maximize recycling in the City, and the Solid Waste Department (Department) provides a number of services and programs aimed at encouraging residents to recycle. Specifically, in March 2003, the City implemented a cart-based, pay-as-you-throw (PAYT) residential refuse program.

In order to support the PAYT program, the City provides residents with curbside-sort recycling service, a 24-hour drop-off recycling center, and curbside yard waste pick up. The yard waste collected at curbside is diverted to the City's composting program. All curbside and drop-off recyclables are processed at the City's Material Recovery Facility (MRF). The PAYT and recycling programs have enabled the City to achieve a very strong residential recycling rate of approximately 48 percent.

In its efforts to maximize recycling, the City has encountered some challenges. First, the curbside-sort recycling program is very manual in nature, and, as such, has higher collection costs than would typically be seen in a more automated program. As participation and tonnage continue to increase, the need for additional vehicles and personnel will increase the cost of the program. Also, the City's recycling system makes it challenging to provide recycling service to commercial customers, including businesses and apartment complexes. The City currently provides an OCC collection program for commercial customers, but has not been able to expand the program to include additional materials due to processing limitations.

R. W. Beck was retained by the City in April 2008 to conduct a Recycling Program Study (Study). The purpose of this Study is as follows:

- Evaluate the current curbside-sort recycling system and provide recommendations to decrease cost and increase material collected.
- Analyze alternative collection and processing options to provide residential curbside recycling, including dual-stream and single-stream.
- Provide analysis and recommendations as to how the City can provide recycling service to commercial and apartment customers.
- Provide analysis and recommendations as to the how the City can provide food waste collection and composting to commercial food waste generators.
- Provide analysis and recommendations as to how the City can process and recycle construction and demolition materials.
- Evaluate the feasibility of utilizing alternative technology for solid waste management, specifically the technology offered by the French company Oxalor.

Methodology

R. W. Beck conducted interviews with City staff in order to obtain the information needed to conduct this Study. Individuals interviewed included representatives from the following positions within the Solid Waste and other City departments:

- Department Management
- Residential Refuse and Recycling Collections Staff
- Commercial Collections Staff
- MRF Operators
- Fleet Operations Staff
- Customer Service and Administrative Staff

In addition to interviews, R. W. Beck spent two days in the field conducting on-site observations of the City's collection and processing operation for recycling. The site observations enabled R. W. Beck to gain a more thorough understanding of the City's current recycling system.

Throughout the conduct of the Study, R. W. Beck maintained consistent communication with City staff in order to ensure that all recommendations and analysis contained in this report are valuable to the City. In addition, R. W. Beck will present the findings and recommendations of this report to the Project Task Force, a group of City staff and elected officials, in a two-day workshop in early 2009.

Commodity Prices

Through much of 2008, markets for recyclable commodities were at all-time highs. The high value of recyclable commodities was largely the result of strong industrial and manufacturing markets in China. However, the global economic downturn at the end of 2008 had a significant impact on prices for recyclable material. A sharp decline in domestic and international manufacturing has reduced demand for raw materials, such as recovered paper, plastics, and metals.[1] As such, prices for recyclable materials rapidly declined, starting in September 2008 with more significant decreases in October and November 2008. Weak pricing has continued into 2009. In fact, there have been reports that many recyclers are unable to sell material due to a significant surplus of available material in the marketplace.

In conducting this Study for the City, R. W. Beck believes that it is important to consider the economic downturn and its result on commodity prices. The average prices that the City has received through November 2008 do not fully reflect current market conditions. Therefore, in conducting feasibility analysis for this Study, R. W. Beck developed projected prices for recyclable commodities. These prices are not intended to predict what commodity values will be in the future, but to develop feasibility analysis for the City that will reflect more normalized recycling market

[1] Source: Joe Truini, "Price Meltdown Roils Markets," *Waste News*, 24 November 2008

conditions. To develop projected prices, R. W. Beck took an average of the actual, year-to-date selling prices for each commodity with the 2008 low price for each commodity as recorded by relevant indices. For fiber materials, R. W. Beck referenced the Official Board Markets (OBM) yellowsheet pricing for the Southwest region. For containers (e.g., plastic, glass, steel and aluminum cans), R. W. Beck referenced Waste News Secondary Materials Pricing (Waste News) indices for the Southcentral region. Table ES-8 summarizes this analysis.

Table ES-1
Assumed Commodity Values (per ton)

Material	2008 Index Low Price [1]	2008 Selling Price [2]	Assumed Commodity Value
Aluminum	$1,200	$1,819	$1,509
HDPE colored	$240	$580	$410
HDPE natural	$120	$580	$350
PET	$80	$354	$217
Steel Cans	$73	$265	$169
Green Glass [3]	$6	$24	$24
Clear Glass	$24	$50	$50
Brown Glass	$12	$35	$35
#6 News	$8	$61	$34
OCC/Chipboard	$23	$97	$60
#8 News	$48	$125	$86

1. Reflects the lowest recoded index price for the months of January through December 2008.
2. Reflects actual average selling prices through November 2008.
3. The City's market for glass is primarily local and is relatively insulated from the global economic crisis. Therefore, R. W. Beck did not assume a decrease in the price for glass.

Evaluation of Current Residential Recycling System

R. W. Beck conducted a comprehensive evaluation of the City's current curbside-sort recycling program. Following are R. W. Beck's key findings and recommendations from this evaluation.

Curb-Sort Program Demonstrates Strong Performance

Based on material recovery rates and the quality of collected material, the City's curb-sort program has demonstrated very strong performance compared to other municipal recycling programs. In the course of the analysis, R. W. Beck found the following:

1. **On a per household basis, the City's residents are recycling 587 pounds of material annually, which is comparable to material quantities generated in some well-established dual-and-single-stream programs.**

2. **Based on experience in the Southwest region of the United States, R. W. Beck would assess the City's residential recycling rate as one of the highest in Arkansas, Texas, and Oklahoma.** Additionally, compared to major cities participating in the Waste News 2007 municipal recycling survey of the 30 largest cities in the United States, only San Diego, San Jose, Seattle, and Portland had higher residential recycling rates than Fayetteville.
3. **The curb-sort program has minimal contamination, as drivers inspect material at the point of collection.** Drivers have the ability to not collect contaminated material.
4. **There is a recent trend in many single-and-dual-stream programs toward including expanded varieties of plastic, such as plastics #3 through #7.** Due to the limited amount of space on the vehicle, as well as the high value of most of the commodities that are currently included in the program (relative to plastics #3-#7), R. W. Beck would not recommend that the City consider including plastics #3 through #7 at this time.

Opportunities Exist to Increase Material Recovery by Increasing Participation

R. W. Beck found that the City's program has a set-out rate of approximately 56 percent. This set-out rate is slightly lower than what R. W. Beck would expect given the strong material recovery rate of the program. The strong material recovery rate coupled with the lower than expected set-out rate suggests that program participants recycle large quantities of material, but that there are many residents that do not participate at all. However, this hypothesis cannot be confirmed with participation rate data. Based on these findings, R. W. Beck recommends the following:

1. **The City should collect participation rate data.** The participation rate data collection effort should occur over one month in order to capture all of the households that participate in the recycling program. An auditor, as opposed to a driver, should collect this data. Drivers can record set-out data while collecting their routes, but should primarily focus on collection efforts while on route.
2. **Use data to target areas with low participation with educational and promotional efforts.** The City's public education efforts are currently focused on reaching the City as a whole. With participation information, the City will be able to focus its efforts on specific geographic areas with low participation in recycling. Some options for educational and promotional efforts include:
3. **Use participation rate information to determine the correlation between refuse cart size and recycling participation.** This information can be used to assess the effectiveness of the variable rate refuse program.

Collection Efficiency is Reasonable Given the Manual Nature of the Curb-sort Program

The City's drivers collect approximately 75 homes per hour on-route. R. W. Beck considers 75 homes per hour to be a reasonable production level given constraints of

the current collection system. The City's current curb-sort collection system has many advantages, such as low material contamination and minimal processing costs. However, low collection efficiency is the primary disadvantage of curb-sort collection systems. For instance, in a fully automated, cart-based collection system, drivers can collect between 125 and 150 homes per hour. In the course of the analysis, R. W. Beck found the following:

1. **The recycling truck drivers exhibit an extraordinary level of effort in collecting and sorting the recyclable material.** The sorting demands of the City's program are among the highest of any program evaluated by R. W. Beck. The City's drivers are very efficient in their sorting and contribute a great deal to the overall success of the program.
2. **The City's curb-sort collection system operates at a very similar production level as the collection operation in Minneapolis.** Fayetteville drivers are able to collect 75 homes per hour of pure route time and Minneapolis drivers are able to collect 74 homes. However, the City of Fayetteville is able to have larger routes due to the 10 hour per day, four day per week work schedule.

The inefficiencies associated with the collection system are due to program type rather than inefficient operation by the City. Therefore, opportunities to increase collection efficiency are limited. However, R. W. Beck recommends the following to increase collection efficiency.

3. **The City should develop specific public education strategies to encourage residents to pre-sort material at curbside.** For instance, the City can develop a flyer for the drivers to leave at households that do not pre-sort. The flyer can include a photo of the truck, a description of the sorting process, and an explanation of proper pre-sorting. Even very large set outs can be sorted quickly and efficiently if residents pre-sort material.
4. **The City should address excess capacity in its recycling routes by increasing the amount of material collected.** Placing an emphasis on increasing the amount of material recovered through the program will eliminate this excess capacity.

Limited Opportunities Exist to Reduce Collection Costs

On a per household basis, the City's collection operation costs $4.23 per month. This is significantly higher than the typical cost associated with dual-or-single stream collection programs. However, the high cost of the City's program is due to the type of program and not inefficient operation of the program. Therefore, opportunities to reduce collection costs are limited. However, R. W. Beck provided the following key findings regarding the curb-sort recycling collection system.

1. **Vehicle costs for the City's recycling trucks are on the low end of what is typically incurred by other types recycling vehicles (e.g., rear-loading and fully-automated).** The City's trucks have fewer moving parts than typical recycling vehicles, such as compacting mechanisms and automated arms. In addition, recyclables are lighter than refuse, meaning that the trucks are required to handle much less weight on a daily basis. For a typical, rear-loading collection

vehicle, annual vehicle costs are around $25,000 per vehicle. The average vehicle costs per truck for the City are approximately $16,000. R. W. Beck would expect that, as the new trucks age, the average annual cost per vehicle will be closer to $20,000, but still below average for other vehicle types.

MRF Facility and Equipment is Adequate for the Current Recycling Program

The MRF is of adequate size and processing capacity to operate at the City's current tonnage level. R. W. Beck also evaluated the City's processing equipment. The following lists R. W. Beck's key findings and recommendations regarding the MRF and the processing equipment.

1. The baler appears to be in good working condition and is satisfactory for the City's current, source-separated recycling program. However, should the City transition to a different style of program (e.g., dual stream or single stream collection) there would be a need for additional processing equipment.
2. **The City has sufficient rolling stock and processing equipment to operate the current system in an efficient manner.**
3. **The City is currently operating the baler at 30 percent utilization.** It is difficult to determine the maximum utilization of the baler that is possible in the City's system. However, R. W. Beck would note that the City has excess capacity in the processing system and could process significantly more material.
4. **The current layout of the MRF does not allow the material to be pushed from the storage bins into the pit.** The current method of moving fiber materials from the storage bins into the pit requires a considerable amount of material handling by the MRF operator. However, the inefficiencies associated with this issue are minor. In addition, the required modifications to the facility that would address this issue would be considerable. Therefore, R. W. Beck does not recommend that the any modifications be made at this time to allow material to be pushed directly from the storage bins into the pit.

Material Selling Prices Exceed Indices

Overall, the City received a 2.8 percent premium price to the regional market for recyclable materials in 2007. The high quality of the City's material and competitive bidding process contributed to the high prices received. R. W. Beck highlights the following key findings and recommendations related to end markets for recovered materials.

1. **For aluminum, HDPE, and PET, the City received prices consistent with the relevant index.**
2. **For newspaper, the City received prices that were approximately 10 percent lower than the regional index.** R. W. Beck would expect that a key reason for this is that residents commingle other grades of paper (e.g., junk mail, mixed paper, magazines) with newspaper.

3. **The City should make an effort to maximize the amount of newspaper that is sold as #8 rather than #6.** Newspaper #8 is generally a higher quality product, resulting in a higher price paid for the material.
4. **The City received prices for steel that were approximately 25 percent lower than the index price.** R. W. Beck would emphasize that, because steel is a relatively insignificant portion of the City's recyclables stream, this price differential does not have a significant detrimental impact on the overall price received for recyclables. R. W. Beck would expect that the City receives lower prices for this commodity due to distance from the primary end users. R. W. Beck would recommend that the City investigate with its material brokers and buyers the reason for the lower than expected price for steel.
5. **The City receives prices for glass that are significantly higher than the regional index due to the relatively close proximity to a glass processing facility.** In fact, the City receives a premium to the index price of approximately 241 percent for green glass, 84 percent for clear glass, and 99 percent for brown glass.
6. **The City receives approximately a 30 percent premium price for its OCC.** R. W. Beck expects that the City's competitive bidding process as well as the high quality of the collected material contribute to this premium.

Opportunities for Public-Private Partnership

In evaluating options for the City's residential recycling program, R. W. Beck analyzed opportunities for the City to enter into a public-private partnership for recycling processing service. R. W. Beck conducted multiple interviews with private processing companies to assess the potential for a public-private partnership. The findings from this interview process served as the basis for developing cost estimates for recycling processing in Section 4 – Alternative Options Analysis. Following are R. W. Beck's recommendations based on the key findings from interviews with private processing companies.

1. **If the City were to pursue a public-private partnership for processing service, a Request for Proposals (RPF) for processing services should be written broadly and inclusively in order to allow all companies to compete, even those that do not currently have facilities in the region.** Interviews revealed that there is interest from the private sector in partnering with the City. Interested companies include those that do not currently have processing capabilities in the region. R. W. Beck recommends that, if the City issues an RFP for processing services, that the RFP be written very broadly to allow for companies to propose creative solutions to providing service. This will maximize the competitiveness of the procurement by allowing companies to participate that do not have facilities in the region.
2. **The City should favor single-stream over dual-stream.** All of the processors interviewed either currently have single-stream facilities or plan to convert their facilities to accept single-stream in the next 12 months.

Additionally, the national trend in recycling programs is away from dual-stream toward single-stream. Depending on the outcome of the financial analysis in Section 4, the City should move toward single-stream recycling over time as they transition away from the current system.

3. **Regardless of public or private ownership, the City should allow and encourage any local MRF to source material from the commercial sector as well as from sources outside of the City.** MRFs achieve economies of scale based on the volume of material processed. If a MRF was able to maximize the amount of material accepted, it would result in improved financial performance as well as reduced processing costs for the City.

Alternative Options Analysis

In this section, R. W. Beck provided an analysis of alternative options for the City to provide curbside recycling service to residential customers. R. W. Beck analyzed both collection and processing options. For collection, R. W. Beck estimated the costs associated with the following options:

- Dual-stream recycling, using 18-gallon bins
- Single-stream recycling, using 96-gallon rolling carts

The costs for these collection options were compared to the status quo system of curb-sort recycling, as evaluated in Section 2 of this report. In addition, R. W. Beck estimated costs associated with the following processing options:

- Process at a City-owned Material Recovery Facility (MRF)
- Contract with a private MRF

Following are R. W. Beck's key findings and recommendations for this analysis.

Collection Cost Savings Can Be Realized

The City can achieve cost savings by transitioning its collection system from the status quo system to dual-stream or single-stream. Below are R. W. Beck's specific findings regarding collection cost savings.

1. **Both dual-stream and single-stream collection systems would provide collection cost savings over the status quo system.** Annual savings in the dual-stream scenario would be $197,024 over the status quo, and annual savings in the single-stream scenario would be $240,953 over the status quo.

2. **The City can achieve greater cost savings with single-stream than with dual-stream.** The monthly collection cost per household for single-stream is $3.64, which represents $1.07 savings over the status quo. The monthly collection cost per household for dual-stream is $3.84, a savings of $0.87 over the status quo.

Single-Stream Provides Benefits over Dual-Stream

Both single-stream and dual-stream are financially feasible for the City and provide cost savings over the status quo system. R. W. Beck recommends that the City move toward a single-stream program as opposed to dual-stream. Single-stream provides greater cost savings for the City. In addition, single-stream can provide many non-financial benefits to the City, such as:

- Single-stream recycling with rolling carts provides greater potential to maximize material recovery and the recycling rate in the City.
- Single-stream provides greater opportunity and flexibility to service multi-family and commercial customers (these options are further discussed in subsequent sections of this report.)
- Automated recycling vehicles provide greater operational efficiency as well as increased safety for recycling drivers.
- The general trend for recycling programs in the nation is toward single-stream. Therefore, if the City transitions to dual-stream, there is a risk that there will be a need to make further program changes in the near future.
- All of the processors interviewed by R. W. Beck either have an operational single-stream MRF or plan to convert their existing facility to single-stream in the next 12 months.

Contracting with a Private MRF is the Preferred Processing Option

Because of the City's relatively low recycling volumes, it is not financially feasible for the City to construct and operate its own dual- or single-stream MRF. On the other hand, contracting with a private MRF could provide financial benefit to the City. Below are R. W. Beck's key findings and recommendations regarding these two potential processing options.

1. **If utilizing a City-owned MRF, the City would incur a net cost of $96 per ton for dual-stream material and $81 per ton for single-stream material.** When combined with collection costs, as shown in Table 4-16, the total system costs are significantly higher than the status quo system costs.
2. **If utilizing a private MRF, the City would receive net revenue of $25 per ton for dual-stream and $23 per ton for single-stream.** This net revenue level is lower than the status quo net revenue of $47 per ton. However, when combined with collection costs, as shown in Table 4-17, the total system costs for single stream provide cost savings over the status quo.

Changing the System Will Require a Policy Decision

As shown in the above analysis, the City has the potential to reduce the costs of the recycling system and increase material recovery by transitioning to single-stream. However, in R. W. Beck's opinion, the potential financial benefits are not pronounced

enough to make the decision to change the program based on cost savings alone. This is primarily because the City has been extremely effective in operating its current program in an efficient manner and recovering high quantities of material. **Although there are financial considerations associated with changing the recycling program, it is R. W. Beck's opinion that the decision whether to transition to a new recycling program will be primarily a policy decision.**

Commercial and Organics Recycling

This section contains R. W. Beck's analysis of how the City can provide commercial recycling service through the follow types of programs:

- Fiber-only recycling
- Single-stream recycling

R. W. Beck also provided an evaluation of whether and how the City can provide commercial organics (e.g., food waste) collection and composting. Following are R. W. Beck's key findings and recommendations regarding this analysis.

Maximize the Existing Commercial Recycling Program

Because of the success they have had in adding customers to the commercial recycling program, the City has made the decision to operate a designated route for this service. The following summarizes R. W. Beck's recommendations as to how the City can maximize this existing recycling route.

Adding Customers to the Program

R. W. Beck recommends that the City maximize its current recycling route by targeting 80 stops per day on the route. The City will need to make a concerted effort to add customers in order to achieve the 80 stops per day target. The following represents specific tactics that may be employed to increase the number of commercial recycling customers.

1. Assign one staff person within Solid Waste with the responsibility to increase the number of commercial recycling customers.
2. All Solid Waste collection staff can help increase the number of commercial recycling customers.
3. Staff should encourage commercial customers to participate in the commercial recycling program by demonstrating opportunities for businesses to reduce their costs.

In addition to the tactics listed above, R. W. Beck would recommend the following regarding adding customers to the commercial recycling program.

4. In recruiting customers for the recycling route, the City should place an emphasis on retaining customers that are in close proximity to one another.
5. In addition, as the program grows, the City may fill up the existing route and have an opportunity to expand to include another recycling route. .

Expand the Materials Collected

R. W. Beck believes that it would be feasible to collect both OCC and office paper as part of this program. This would require manual sorting of the two commodities at the City's processing facilities. As such, R. W. Beck recommends the following:

1. **The City should consider accept commingled office paper and OCC on a pilot basis** in order to ensure that it is operationally viable to manually sort the two commodities.
2. **The City should investigate whether it would be possible to sell bales of commingled OCC and office paper to brokers and end users.**

Consider Implementing Food Waste Collection

Based on this analysis, R. W. Beck believes that it is feasible for the City to collect food waste from commercial customers and would recommend that the City further consider implementing this type of program. R. W. Beck's key findings and recommendations regarding food waste collection and composting are as follows.

1. **The City could integrate up to approximately 1,700 tons of food waste into its current composting operation.** Accepting food waste in the current compost operation will require the City to obtain a permit modification from ADEQ. When implementing food waste composting, it will be critical for the City to gradually increase the amount of food waste feedstock in order to continually monitor and test the compost product.
2. **R. W. Beck recommends that the City source produce only from supermarkets.** This would allow the City to have control over feedstock and develop expertise in composting a particular type of food waste.
3. **The City should gradually retain commercial food waste customers in order to ensure the appropriate composition of the compost feedstock.** The City should approach each potential customer and emphasize the benefits of the program, specifically any opportunity for the customer to reduce overall collection costs.
4. **The City should utilize excess capacity in the refuse collection system to service food waste customers.** For instance, the first front-load refuse truck to finish their route each day would be sent back out to collect food waste from the customers scheduled for collection.
5. **Constructing a concrete pad at the compost site would represent a significant capital investment for the food waste composting program.** R. W. Beck recommends that the City further evaluate whether a concrete pad would be an operational or regulatory requirement for the food waste composting program. If it is a requirement, R. W. Beck recommends that the City conduct more thorough market research (e.g., talking with potential customers) before moving forward with the program to justify the capital investment for the pad.

6. **In developing a food waste composting program, the City should integrate the food waste material into the current, windrow composting system.**

Encourage Diversion through Service Rates

The City should structure its recycling and refuse rates in such a way to encourage diversion of material. Following are R. W. Beck's key findings and recommendations regarding rates for commercial refuse and recycling service.

1. **The City should maintain the current rates for commercial recycling.** The current rates for commercial recycling are sufficient to recover the incremental cost of providing the service and also encourage diversion.
2. **The City has the opportunity to set food waste collection rates that represent a nine to 15 percent discount to refuse rates.**
3. **The current commercial refuse rate structure provides incentive for customers to recycle as much as possible.** The current refuse rate structure is volume-based.

Apartment Recycling

The City currently has a drop-off center that is open for use to all City residents, including apartment residents. In this section, R. W. Beck provided an evaluation of the current drop-off center. In addition, R. W. Beck presented three options for the City to expand apartment recycling, including:

- Expand the drop-off program
- Include apartment complexes on curb-sort routes
- Provide single-stream recycling service

Following are R. W. Beck's key findings and recommendations pertaining to the drop-off program and the potential recycling options.

Continue Successful Drop-Off Program and Consider Program Expansion

The City has a strong drop-off program that performs well financially as well as with material diversion. Following are R. W. Beck's key findings and recommendations regarding the drop-off program.

1. **The drop-off center provides $0.08 in revenue per household on a monthly basis**. In addition, the drop-off center alone diverts 4.5 percent of the City's residential material.
2. **It is unknown how many of the current drop-off participants are multi-family residents.** In order to increase apartment diversion, R. W. Beck recommends that the City develop a public education campaign that is targeted to apartment residents to encourage use of the drop-off center.

3. **As the City replaces the signage at the drop-off center, R. W. Beck recommends that the City move toward using signage with graphics rather than text-only.**

4. **The City would incur a cost of between $0.56 and $0.58 per household to develop an additional drop-off center.** R. W. Beck recommends that the cost of this facility be recovered from single-family and multi-family residents.

Options for On-Site Apartment Recycling are Limited

Based on R. W. Beck industry experience, the curb-sort system is not feasible to be implemented on a large-scale basis. However, R. W. Beck provided some discussion and preliminary analysis of how the residential program could be extended to a small number of apartment complex customers without adding additional staff or equipment. In addition, R. W. Beck provided some discussion on single-stream recycling. Following are R. W. Beck's key findings and recommendations regarding options to provide on-site recycling service.

1. **In R. W. Beck's opinion, the current system is not a viable option for a mandatory, City-wide apartment recycling program because there are significant barriers to implementation.** These barriers include, but are not limited to: large size of the apartment complexes, contamination issues, management buy-in, collection container problems, space required for the collection area, and the billing system.

2. **It would be potentially feasible for the City to include up to 40 apartment complexes on the current, curb-sort recycling routes for single family,** or approximately one apartment complex per route each day. R. W. Beck would expect that each route serving one apartment complex per day is operationally feasible given that the apartment complexes are located in the vicinity of the single family residential route. If the City were to implement a small-scale program, it would be important to reserve the right to not serve very large apartment complexes.

3. **The City would be able to provide single-stream service to apartment customers only if the City transitioned to single-stream for residential customers.** R. W. Beck would recommend that a single-stream program for apartment complexes be an extension of the single family program.

Construction and Demolition Recycling

In this section, R. W. Beck provided an analysis of the feasibility to develop a construction and demolition (C&D) recycling facility. As part of this analysis, R. W. Beck estimated the volume and composition of C&D material generated in the City as well as in Northwest Arkansas.

There are numerous options for the type of C&D recycling facility that the City could develop. In this analysis, R. W. Beck examined the financial feasibility of three options for the facility, listed below.

- Regional (large-scale) C&D MRF
- Local (small-scale) C&D MRF
- Manual sorting at the transfer station

The following summarizes R. W. Beck's key findings and recommendations from this analysis.

1. **The quantity of C&D material being generated in the City and in Northwest Arkansas is unknown.** R. W. Beck estimates that between 4,000 and 6,000 tons of C&D material are hauled and disposed by City collection crews on an annual basis.

2. **The feasibility of a large-scale, regional C&D MRF is largely dependent on the amount material the City is able to source from the region.** For instance, if the City is able to source more than 50,000 tons of material – at current commodity prices – the facility disposal fee is competitive with other disposal options in the region. However, based on the sensitivity analysis, if the City only sources 10,000 or 30,000 tons of material, the tipping fee would be significantly higher than other disposal options for C&D material. Therefore, R. W. Beck would recommend that the City consider a large-scale, regional MRF as a long term option.

3. **Since the City controls a small portion of the regional C&D waste stream, there is risk associated with developing a large-scale facility.** According to R. W. Beck's estimates, the City controls approximately 2.5 percent of the regional C&D waste stream. Therefore, if the City were to develop a facility, it could potentially be challenging to source material from private haulers and other municipalities.

4. **A small-scale, local MRF is financially infeasible given the City's current tonnage level.** Even considering higher commodity values, as shown in the sensitivity analysis, the required tipping fee for this facility is substantially greater than existing disposal options in the City.

5. **A manual sorting facility at the City's transfer station is a potentially feasible option.** If the City were to increase C&D tonnage to 7,500 tons, the tipping fee for the facility would be more comparable to the current cost of disposal of $24.47. If the City were to increase C&D tonnage to 10,000 tons, the tipping fee for the facility would be less than the cost of disposal.

Emerging Technologies Analysis

R. W. Beck conducted a planning level evaluation of new systems or technologies that could refine, modify, or completely change the City's current recycling system or the

entire waste management program. Based on direction from City staff, R. W. Beck evaluated the organic waste treatment unit proposed by the French company Oxalor. The following summarizes R. W. Beck's key findings and recommendations from this evaluation.

1. **Use of the Oxalor technology would represent a significant change to how solid waste is currently managed in the City.** There would likely be significant political, operational, and financial challenges to converting the current system to the Oxalor system.

2. **The Oxalor system is one of many alternative solid waste management technologies.** Other alternative technologies for consideration include but are not limited to anaerobic digestion, gasification, source separated composting, waste-to-energy. Some of these technologies are currently being utilized domestically, unlike the Oxalor technology. If the City decides to pursue an alternative technology, R. W. Beck would recommend that the City conduct a more comprehensive review of all of the available options in order to determine which technology is most appropriate for the City.

3. **The Oxalor system would increase the City's solid waste management costs.** Based on R. W. Beck's financial analysis, the cost per ton to process MSW using the Oxalor system is $53, which is more than twice the current cost of disposal of approximately $24 per ton. The City would achieve some cost savings associated with discontinuing its composting and recycling collection programs; however, these cost savings would not be enough to offset the cost increase of using the Oxalor system. In addition, without any commercially operating reference facilities, it is possible that the projected costs to develop and operate a facility are understated.

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Section 1
Project Overview

1.1 Project Purpose

The City of Fayetteville, Arkansas (City) has made a concerted effort to maximize recycling in the City, and the Solid Waste Department (Department) provides a number of services and programs aimed at encouraging residents to recycle. Specifically, in March 2003, the City implemented a cart-based, pay-as-you-throw (PAYT) residential refuse program. Residents are offered three different sizes of refuse containers with increasing service fees that correspond to the container size, as listed below.

- 32 gallon cart - $8.75 monthly service fee
- 64 gallon cart - $13.35 monthly service fee
- 96 gallon cart - $18.96 monthly service fee

In order to support the PAYT program, the City provides residents with curbside-sort recycling service, a 24-hour drop-off recycling center, and curbside yard waste pick up. The yard waste collected at curbside is diverted to the City's composting program. All recyclables are processed at the City's Material Recovery Facility (MRF). The PAYT and recycling programs have enabled the City to achieve a very strong residential recycling rate of approximately 48 percent.

In its efforts to maximize recycling, the City has encountered some challenges. First, the curbside-sort recycling program is very manual in nature, and, as such, has higher collection costs than would typically be seen in a more automated program. As participation and tonnage continue to increase, the need for additional vehicles and personnel will increase the cost of the program. Also, the City's recycling system makes it challenging to provide recycling service to commercial customers, including businesses and apartment complexes. The City currently provides an OCC collection program for commercial customers, but has not been able to expand the program to include additional materials due to processing limitations at the MRF.

R. W. Beck was retained by the City in April 2008 to conduct a Recycling Program Study (Study). The purpose of this Study is as follows:

- Evaluate the current curbside-sort recycling system and provide recommendations to decrease cost and increase material collected.
- Analyze alternative collection and processing options to provide residential curbside recycling, including dual-stream and single-stream.
- Provide analysis and recommendations as to how the City can provide recycling service to commercial and apartment customers.

- Provide analysis and recommendations as to how the City can process and recycle construction and demolition materials.
- Provide analysis and recommendations as to the how the City can provide food waste collection and composting to commercial food waste generators.
- Evaluate the feasibility of utilizing alternative technology for solid waste management, specifically the technology offered by the French company Oxalor.

The remainder of this section describes the methodology used by R. W. Beck in the conduct of this Study. In addition, this section contains some baseline program data, waste generation projections, and commodity price assumptions that are referenced in subsequent sections of this report.

1.2 Methodology

R. W. Beck conducted interviews with City staff in order to obtain the information needed to conduct this Study. Individuals interviewed included representatives from the following positions within the Solid Waste and other City departments:

- Department Management
- Residential Refuse and Recycling Collections Staff
- Commercial Collections Staff
- MRF Operators
- Fleet Operations Staff
- Customer Service and Administrative Staff

In addition to interviews, R. W. Beck spent two days in the field conducting on-site observations of the City's collection and processing operation for recycling. The site observations enabled R. W. Beck to gain a more thorough understanding of the City's current recycling system.

Throughout the conduct of the Study, R. W. Beck maintained consistent communication with City staff in order to ensure that all recommendations and analysis contained in this report are valuable to the City.

The tables in this report summarize financial models developed by R. W. Beck and have been rounded to the nearest dollar or whole number for simplicity of presentation. As such, figures shown in the tables may not add or subtract precisely due to rounding issues.

1.3 Report Organization

This report is organized into an Executive Summary, eight report sections, and appendices. The sections of this report are listed as follows:

- Executive Summary
- Section 1 – Project Overview

- Section 2 – Evaluation of Current Residential Recycling System
- Section 3 – Opportunities for Public-Private Partnership
- Section 4 – Alternative Options Analysis
- Section 5 – Commercial and Organics Recycling
- Section 6 – Apartment Recycling
- Section 7 – Construction and Demolition Recycling
- Section 8 – Emerging Technologies Analysis
- Appendices

1.4 Data Analysis

1.4.1 Program Data

R. W. Beck treated 2008 as a baseline year and assumed all tonnage was kept constant from 2007. R. W. Beck also kept constant the baseline number of accounts at 18,830 household. Table 1-1 summarizes 2008 baseline tonnage assumptions.

Table 1-1
2008 Baseline Tonnage Assumptions

Program	Tons	% of Total
Residential		
Refuse	12,870	20%
Curbside recycling	5,523	8%
Drop off recycling	1,113	2%
Composting	5,127	8%
Total Residential	24,633	38%
Commercial		
Front load	30,066	46%
Roll off	9,704	15%
OCC	928	1%
Other recycling [1]	231	0%
Total Commercial	40,929	62%
Total Waste Generated	65,562	100%

1. Includes in-house recycling, commercial igloos, and scrap metal.

Table 1-2 shows the breakdown of tons between the City's recycling programs in 2008.

Table 1-2
Material Generated from City Recycling Programs

Program	Tons	Percent
Curbside sort	5,523	71%
In-house (City)	59	1%
Drop-off	1113	14%
Igloos (Commercial)	51	1%
Commercial OCC	928	12%
Scrap Metal	121	1%
Total	7,795	100%

Table 1-3 summarizes the residential, commercial, and City-wide recycling rates for 2008, based on tonnage assumptions shown in Table 1-1. R. W. Beck emphasizes that these recycling rates include only the material that is collected and processed/disposed by the City's Solid Waste Department and does not include tonnage handled by private companies.

Table 1-3
Residential, Commercial, and Overall Recycling Rates

Recycling Rate	Residential	Commercial	Overall
Recycled Material	11,763	1,159	12,922
Refuse	12,870	39,770	52,640
Waste Generation	24,633	40,929	65,562
Recycling Rate	48%	3%	20%

1.4.2 Projected Population Growth and MSW Generation

R. W. Beck provided the City with an understanding of the impacts of population growth over five, 10, and 20 years. The following are R. W. Beck's projections for population growth and MSW generation for the five, 10, and 20 year planning horizon under three different scenarios: status quo, dual-stream, and single-stream.

Table 1-4
Residential Waste Stream Projections (in tons)

Options [1]	2009	2010	2011	2012	2013	2018	2028
Status Quo							
Refuse	14,281	14,844	15,198	15,553	15,907	17,679	21,519
Recycling	6,638	6,638	7,365	7,655	7,838	8,935	10,859
Composting	5,131	5,693	5,918	6,059	6,201	6,907	8,395
Total	26,049	27,175	28,481	29,268	29,946	33,521	40,774
Dual-Stream							
Refuse	14,145	14,703	15,054	15,405	15,756	17,511	21,315
Recycling	7,501	7,797	7,983	8,169	8,355	9,286	11,303
Composting	5,693	5,918	6,059	6,201	6,342	7,048	8,579
Total	27,339	28,418	29,096	29,774	30,453	33,845	41,197
Single-Stream							
Refuse	12,891	13,400	13,720	14,040	14,359	15,959	19,426
Recycling	8,754	9,100	9,317	9,534	9,751	10,838	13,192
Composting	5,693	5,918	6,059	6,201	6,342	7,048	8,579
Total	27,339	28,418	29,096	29,774	30,453	33,845	41,197

1. All recycling numbers shown are net of contamination.

Table 1-5 contains R. W. Beck's commercial waste projections assuming the current programs in place remain unchanged.

Table 1-5
Commercial Waste Stream Projections (in tons)

Options	2009	2010	2011	2012	2013	2018	2028
Front-Load	31,301	32,536	33,313	34,090	34,866	38,750	47,168
Roll Off	10,103	10,501	10,752	11,003	11,253	12,507	15,224
OCC	966	1,004	1,028	1,052	1,076	1,196	1,456
Other Recycling	231	231	231	231	231	231	231
Total	42,601	44,273	45,324	46,375	47,427	52,684	64,079

1.4.3 Projected MRF Tonnage

Table 1-6 summarizes tonnage that is projected to be processed at a potential City-owned dual-stream or single-stream MRF. The table shows the tons processed net of residuals as well as gross tons processed. R. W. Beck accounted for a 10 percent residual rate for dual-stream and a 15 percent residual rate for single stream. These assumptions are discussed in more detail in Section 4 – Alternative Options Analysis.

Table 1-6
City-Owned MRF Recyclable Tonnage Projections (in tons)

Options	2008	2009	2010	2011	2012	2013	2018	2028
Dual-Stream MRF								
Residential	6,760	7,501	7,797	7,983	8,169	8,355	9,286	11,303
Commercial OCC	928	966	1,004	1,028	1,052	1,076	1,196	1,456
Net Tons	7,688	8,467	8,801	9,011	9,221	9,431	10,482	12,759
Gross Tons [1]	8,439	9,300	9,667	9,898	10,129	10,359	11,513	14,015
Single-Stream MRF								
Residential	7,890	8,754	9,100	9,317	9,534	9,751	10,838	13,192
Commercial OCC	928	966	1,004	1,028	1,052	1,076	1,196	1,456
Net Tons	8,818	9,720	10,104	10,345	10,586	10,828	12,034	14,648
Gross Tons [2]	10,210	11,265	11,710	11,989	12,269	12,548	13,946	16,976

1. R. W. Beck assumed a 10% residual rate for residential material and a negligible residual rate for commercial OCC.
2. R. W. Beck assumed a 15% residual rate for residential material and a negligible residual rate for commercial OCC.

1.4.4 Commodity Price Analysis and Assumptions

The value of recyclable commodities has a significant impact on the City's recycling programs. Revenue generated from the sale of commodities provides an offset to program costs. Table 1-7 shows the prices (per ton) that the City received for its recyclable commodities over the last five years.

Table 1-7
Average Selling Price for Recyclable Commodities (per ton)

Material	2004	2005	2006	2007	2008 [1]	Average
Aluminum	$857	$1,315	$1,637	$1,727	$1,819	$1,471
HDPE	$209	$535	$494	$531	$580	$470
PET	$387	$374	$281	$348	$354	$349
Steel Cans	$116	$49	$72	$147	$265	$129
Green Glass	$20	$20	$19	$25	$24	$22
Clear Glass	$40	$40	$39	$50	$50	$44
Brown Glass	$30	$30	$30	$35	$35	$32
#6 News	$49	$50	$29	$57	$61	$49
OCC/Chipboard	$59	$69	$93	$129	$97	$89
#8 News	$66	$84	$71	$87	$125	$87

1. Through November 2008

Through much of 2008, markets for recyclable commodities were at all-time highs. The high value of recyclable commodities was largely the result of strong industrial and manufacturing markets in China. However, the global economic downturn at the

end of 2008 had a significant impact on prices for recyclable material. A sharp decline in domestic and international manufacturing has reduced demand for raw materials, such as recovered paper, plastics, and metals.[1] As such, prices for recyclable materials rapidly declined, starting in September 2008 with more significant decreases in October and November 2008. Weak pricing has continued into 2009. In fact, there have been reports that many recyclers are unable to sell material due to a significant surplus of available material in the marketplace.

In conducting this Study for the City, R. W. Beck believes that it is important to consider the economic downturn and its result on commodity prices. The average prices that the City has received through November 2008 do not fully reflect current market conditions. Therefore, in conducting feasibility analysis for this Study, R. W. Beck developed projected prices for recyclable commodities. These prices are not intended to predict what commodity values will be in the future, but to develop feasibility analysis for the City that will reflect more normalized recycling market conditions. To develop projected prices, R. W. Beck took an average of the actual, year-to-date selling prices for each commodity (as shown in Table 1-7) with the 2008 low price for each commodity as recorded by relevant indices. For fiber materials, R. W. Beck referenced the Official Board Markets (OBM) yellowsheet pricing for the Southwest region. For containers (e.g., plastic, glass, steel and aluminum cans), R. W. Beck referenced Waste News Secondary Materials Pricing (Waste News) indices for the Southcentral region. Table 1-8 summarizes this analysis.

Table 1-8
Assumed Commodity Values (per ton)

Material	2008 Index Low Price [1]	2008 Selling Price [2]	Assumed Commodity Value
Aluminum	$1,200	$1,819	$1,509
HDPE colored	$240	$580	$410
HDPE natural	$120	$580	$350
PET	$80	$354	$217
Steel Cans	$73	$265	$169
Green Glass [3]	$6	$24	$24
Clear Glass	$24	$50	$50
Brown Glass	$12	$35	$35
#6 News	$8	$61	$34
OCC/Chipboard	$23	$97	$60
#8 News	$48	$125	$86

1. Reflects the lowest recoded index price for the months of January through December 2008.
2. Reflects actual average selling prices through November 2008.
3. The City's market for glass is primarily local and is relatively insulated from the global economic crisis. Therefore, R. W. Beck did not assume a decrease in the price for glass.

[1] Source: Joe Truini, "Price Meltdown Roils Markets," *Waste News*, 24 November 2008

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Section 2
Evaluation of Current Residential Recycling System

2.1 Overview

R. W. Beck conducted an evaluation of the current residential recycling system in order to provide recommendations to lower costs and increase material recovery. As part of this analysis, R. W. Beck analyzed the City's collection and processing operations for residential recycling, as well as policy and public education considerations. R. W. Beck also determined the cost of service for the residential recycling system.

At the end of this section, R. W. Beck summarized the key findings and recommendations for improving the current residential recycling system. This analysis is focused on the current residential recycling system; subsequent sections of this report will analyze options to increase material recovery and decrease costs by transitioning to a different type of recycling system.

2.2 Collection Operation

The City of Fayetteville operates a curbside-sort (curb-sort) recycling program for its approximately 18,830 residential accounts. The collection and processing functions of the recycling program are both operated by the City. The City has 18-gallon plastic bins with lids for recycling collection (see Figure 2-1).

Figure 2-1: Recycling Bins with Lids

In this section, R. W. Beck evaluated the efficiency and effectiveness of the current collection operation, including the following:

- Materials included
- Program performance
- Staffing and equipment
- On-route operations
- Collection efficiency

2.2.1 Curbside-Sort Benchmarking

This analysis includes references to similar curb-sort programs in order to provide a more thorough assessment of the City's current system. R. W. Beck utilized its internal database of recycling programs in order to identify appropriate cities for this analysis. In addition, R. W. Beck contacted Kann, the company that designed and manufactured the body of the City's curb-sort truck, in order to identify any other cities with a similar recycling program.[1] R. W. Beck selected the following cities for inclusion in this benchmarking analysis.

- Jacksonville, Arkansas
- Killeen, Texas
- Minneapolis, Minnesota
- Olathe, Kansas

The following table shows summary information for the recycling programs in each of these cities.

Table 2-1
Benchmark City Summary

City	Program Type	Subscription Rate [1]	Homes Served [2]	Collection Frequency	Container
Fayetteville, AR	Curb sort, city-wide	n/a	18,830	Weekly	18-gallon bin
Jacksonville, AR	Curb sort, city-wide	n/a	7,800	Weekly	3 open bins [3]
Killeen, TX	Curb sort, subscription	6%	2,400	Weekly	22-gallon bin
Minneapolis, MN	Curb sort, rebate [4]	n/a	108,000 [5]	Bi-weekly	24-gallon bin
Olathe, KS	Curb sort, subscription	27%	9,800	Weekly	18-gallon bin

1. Refers to the number of subscribers divided by the total residential households in the City.
2. For cities with subscription programs, this represents the number of subscribers, not the total number of households in the City.
3. The exact size of these bins is unknown; however R. W. Beck estimates that they are approximately 10-14 gallons each.
4. Participating residents receive a rebate on their monthly solid waste bill.
5. Approximately half of these accounts are served by a private hauler due to a city ordinance.

[1] A representative from Kann did not identify other cities with similar recycling programs.

In evaluating the benchmark cities, R. W. Beck found that the City of Minneapolis has the most similar program to Fayetteville in terms of the following factors, which will be further discussed in subsequent analysis:

- Materials included
- Collection operation
- Program performance

R. W. Beck identified two key differences between these two recycling programs. The first is that Minneapolis residents receive a rebate on their monthly solid waste service bill if they participate in the program. The second key difference is that Minneapolis collects recyclables every other week, rather than weekly.

Data from the programs in the Cities of Jacksonville, Killeen, and Olathe will be used in portions of the subsequent analysis. However, R. W. Beck would consider these programs inappropriate for the purposes of detailed benchmarking because:

- In the cases of Killeen and Olathe, the subscription-based nature of the program makes it difficult to compare to a City-wide program.
- The programs in Olathe and Jacksonville include considerably fewer types of materials than Fayetteville.
- None of the three programs are performing to the level that is seen in Fayetteville in terms of material recovery and recycling rate.

2.2.2 Materials Included

The following materials are included in the City's curb-sort program and are separated into 10 compartments on the recycling vehicle.

- Aluminum cans
- Plastic bottles #1 (PET)
- Plastic bottles #2 (HDPE colored and natural)
- Steel cans
- Glass beverage containers (green, clear and brown)
- Newspaper (#6 and #8) [2]
- Old corrugated cardboard (OCC) and chipboard

Table 2-2 shows materials that are included in the recycling programs in the four benchmarked cities. As shown in the table, the variety of materials that is included in the City's program is equal to, if not better than, other curb-sort programs. In fact, the City is recycling the majority of the materials that are typically included in dual-stream and single-stream recycling programs.

[2] Newspaper #6 is a grade of material that is typically collected from curbside recycling programs and can include material such as junk mail and other paper. Newspaper #8 is of a higher quality and cannot contain paper other than newsprint (*Source: ISRI Scrap Specifications Circular, 11/2007*).

Table 2-2
Curb-Sort Program Materials

City	Aluminum	Steel Cans	Glass [1]	Plastic #1	Plastic #2	Newspaper	OCC	Chipboard	Mixed Paper [2]
Fayetteville, AR	■	■	■	■	■	■	■	■	■
Jacksonville, AR	■			■	■	■	■		
Killeen, TX	■	■	■	■	■	■	■	■	■
Minneapolis, MN	■	■	■	■	■	■	■	■	■
Olathe, KS	■	■	■	■	■				■

1. Includes green, clear, and brown container glass.
2. Includes various paper products, including junk mail and magazines.

Overall, R. W. Beck considers the current material stream to be very satisfactory for the City's program, as it includes most materials that are currently accepted in programs that allow more commingling. There is a recent trend in many single-and-dual-stream programs toward including expanded varieties of plastic, such as plastics #3 through #7. The inclusion of these types of material in the City's program would require removing another material from the program or commingling two existing materials into one compartment on the truck. Due to the limited amount of space on the vehicle, as well as the high value of most of the commodities that are currently included in the program (relative to plastics #3-#7), R. W. Beck would not recommend that the City consider including plastics #3 through #7 at this time.

2.2.3 Program Performance

Residential Recycling Rate

The City collected 5,523 tons of material from the curb-sort recycling program in 2007. R. W. Beck calculated a three year average material composition to estimate the material composition of the curb-sort stream. Table 2-3 shows the average material composition calculated by R. W. Beck as well as the projected tonnage by material from the curb-sort program for the past three years.

On a per household basis, the City's residents recycle 587 pounds of material annually.[3] Based on R. W. Beck's experience, the City's curb-sort program has demonstrated strong performance in the quantity of material diverted. Dual-and-single-stream programs are typically able to generate more material than curb-sort programs; however, the amount of material diverted per household in Fayetteville is consistent with material quantities generated in some well-established dual-and-single stream programs. For instance, R. W. Beck completed a survey of 70 communities in

[3] (5,523 tons* 2,000)/18,830 households = 587 pounds per household

North Central Texas, where there is a strong trend toward single-stream recycling.[4] Of these 70 communities, only the Cities of Frisco, Highland Village, and Little Elm generated more than 587 pounds of recyclables per household.[5] In addition, the curbside program in Fayetteville is collecting more material than any of the curbside programs in Pulaski County, Arkansas, including Little Rock, North Little Rock, and Maumelle.[6]

Table 2-3
Estimated Materials Collected from Curbside Program

Material	Average Composition	2005 (Tons)	2006 (Tons)	2007 (Tons)
Aluminum	1.3%	59	67	73
HDPE	2.2%	97	111	121
PET	3.1%	138	158	172
Steel Cans	2.7%	121	139	151
Green Glass	4.5%	197	226	246
Clear Glass	6.5%	287	329	358
Brown Glass	8.5%	376	431	469
#6 Newspaper	16.8%	743	852	927
Chipboard	17.7%	783	898	977
#8 Newspaper	36.7%	1,625	1,864	2,028
Total	100.0%	4,424	5,076	5,523

Table 2-4 shows the per-household material quantities generated from the curb-sort benchmark programs. Of these programs, Fayetteville is also generating the most material on a per-household basis. However, the Minneapolis program also demonstrates strong performance in terms of material recovery. For the subscription-based programs, R. W. Beck showed the per-household recycling quantities based on the number of subscribers as well as the total number of residential households in the city in order to provide an "apples-to-apples" comparison to the city-wide programs.

[4] North Central Texas refers to the 16-county region encompassing the Dallas-Fort Worth Metroplex.
[5] Source: *Regional Recycling Rate Benchmarking Study*, prepared by R. W. Beck for the North Central Texas Council of Governments, October 2007
[6] Source: *Regional Needs Assessment*, Pulaski County Regional Solid Waste Management District, January 2008

Table 2-4
Household Recycling in Curb-Sort Programs

Community Name	Annual Tons [1]	Lbs/Household (All Households)	Lbs/Household (Subscribers Only)
Fayetteville, AR	5,523	587	n/a
Minneapolis, MN [2]	22,205	370	411
Jacksonville, AR	466	119	n/a
Killeen, TX	380	19	317
Olathe, KS	1,965	108	401

1. Data from Fayetteville, Killeen, and Olathe is from 2007. Jacksonville data is from 2006 and Minneapolis data is from 2004.
2. For the Minneapolis program, customers that do not recycle are charged an extra fee. For this table, subscribers represent the customers who participate in the recycling program, even though it is not a true subscription program.

Table 2-5 shows the residential recycling rate in the City as calculated by R. W. Beck. The residential recycling rate in the City is 47.8 percent, including material generated from the curb-sort, drop-off, and composting programs.

Table 2-5
2007 Residential Recycling Rate

Waste Generation	Tons	% of Total
Recyclables (curb-sort)	5,523	22.4%
Recyclables (drop-off)	1,113	4.5%
Yard Waste (composting)	5,127	20.8%
Refuse disposed	12,870	52.2%
Residential Waste Generation	24,633	100.0%
Residential Recycled Tonnage [1]	11,763	47.8% [2]

1. Including curb-sort recyclables, drop-off recyclables, and yard waste for composting.
2. (Curb sort tonnage + drop off tonnage + yard waste tonnage)/Residential waste generation = residential recycling rate

Based on experience in the Southwest region of the United States, R. W. Beck would assess the City's residential recycling rate as one of the highest in Arkansas, Texas, and Oklahoma. In addition, compared to major cities participating in the Waste News 2007 municipal recycling survey of the 30 largest cities in the United States, only San Diego, San Jose, Seattle, and Portland had higher residential recycling rates than the City of Fayetteville.[7]

Set-Out Rate and Participation Rate

The City provided set-out rate data to R. W. Beck that was recorded during the weeks of September 24, October 1, and October 8 of 2007. The set out rate represents the

[7] Source: *Municipal Recycling Survey*, Waste News, February 2007

number of households on a residential collection route that set out materials during a given week. To gather this data, each recycling truck driver recorded the number of homes that set out materials for recycling on a particular route. This data was recorded for all routes during the week. An average of 10,520 households set out materials for recycling during these three weeks, resulting in a set-out rate of approximately 56 percent.[8]

Collecting set out rate data can be challenging for municipalities with limited staff resources as well as for municipalities that contract for recyclables collection. In addition, the methodologies that are used to collect data and calculate the set out rate often vary between communities. Because of these reasons, R. W. Beck does not have an extensive database of set out rate information from other communities. However, a set out rate of 56 percent is slightly lower than what R. W. Beck would expect given the very strong material recovery rate of the program. In other words, R. W. Beck would have expected that a higher number of customers would be participating in the program relative to the quantities of materials recycled. This could mean that future increases in the recycling rate will depend more on encouraging more customers to participate in the program rather than increasing the amount of material from customers who are already participating.

The City was not able to provide specific participation rate data, as data collection efforts within the department have been focused on weekly bin counts and set out rates. A participation rate represents an understanding of which specific households on the recycling routes participate in the program at some point during a defined period of time, usually a month. This requires tracking which specific addresses set out materials in a given month. See the table below for an example form to track recycling participation rates. Using this example, the first three addresses would count toward the participation rate, whereas the last address would not.

Table 2-6
Participation Rate Example [1]

Route #	Address	Week 1	Week 2	Week 3	Week 4
123	1 Main Street	✓			
123	2 Main Street	✓		✓	
123	3 Main Street	✓	✓	✓	✓
123	4 Main Street				

1. Check marks indicate that the household set recyclables out for collection on their collection day.

Participation rate data would provide the City with the following benefits:

- Participation rate data can identify specific geographic areas with relatively low participation in recycling, which would enable the City to develop targeted public education campaigns.

[8] 10,520/18,830 households = 55.9% set out rate

- The City would have information on the number of homes per route that participate, allowing for more balanced routing.
- With participation rate data based on addresses, the City can assess the correlation between refuse cart size and recycling participation.

R. W. Beck would recommend that the City begin to collect participation rate data. Because the City is already committed to collecting program data, having collected bin count and set out information, collection of participation rate data should only require marginally more time and effort.

2.2.4 Staffing and Equipment

Vehicles

The City is currently in the process of transitioning to a new fleet of recycling vehicles. The previous recycling trucks were very similar to the new trucks as they had 10 compartments for source separated recycling. However, the new trucks were designed to provide greater collection efficiencies and safety for drivers. In fact, there have been no driver injuries since February 21, 2007, as compared to four in 2006 and three in 2007 prior to February 21. Figure 2-2 shows one of the City's new recycling vehicles with a body manufactured by Kann. The City has seven front-line trucks with the new, Kann body. The City also has two front-line and three spare vehicles with the older bodies.

Figure 2-2: Fayetteville Recycling Truck with Kann Body

The new recycling trucks provide the following benefits to the recycling operation.

- The old recycling trucks required the driver to push plastic bottles overhead into a compartment at the top of the recycling vehicle, resulting in some shoulder injuries. The new truck bodies have been designed to eliminate this problem.

- The old trucks required drivers to step up onto a platform to sort materials into the various containers, resulting in some ankle injuries. The new trucks allow the drivers to stand on the ground while sorting materials.
- The new trucks are equipped with compactors for plastics #1 and #2, allowing for more material to be collected before making a trip to the MRF.
- Drivers of the new trucks are able to adjust the size of the various compartments on the vehicle according to which materials are the most prevalent on a particular route or day.

The table below shows the average vehicle costs that the City incurs for each type of vehicle on an annual basis. The data presented in the table is based on actual vehicle costs from 2007.

Table 2-7
Annual Costs per Vehicle [1]

Vehicle Type	Quantity	Maintenance	Repairs	Fuel	Shop Overhead [2]	Total
SAC – front line	2	$803	$10,245	$5,464	$3,168	$19,680
SAC – spare	3	$564	$12,146	$4,868	$3,577	$21,155
Kann – front line	7	$497	$2,646	$6,051	$3,810	$13,004
Average [3]	n/a	$565	$6,288	$5,657	$3,645	$16,154

1. Data shown in the table is based on actual costs incurred by the City in 2007.
2. Shop overhead includes accident and warranty costs, shop overhead costs, and shop overhead insurance costs.
3. Represents the weighted average annual cost per vehicle. The average is weighted according to the number of each style of truck.

Generally speaking, R. W. Beck would expect vehicle costs for the City's recycling trucks to be on the low end of what is typically incurred by other types recycling vehicles (e.g., rear-loading and fully-automated). The City's trucks have fewer moving parts than typical recycling vehicles, such as compacting mechanisms and automated arms. In addition, recyclables are lighter than refuse, meaning that the trucks are required to handle much less weight on a daily basis. For a typical, rear-loading collection vehicle, annual vehicle costs, such as the costs shown in the above table, are around $25,000 per vehicle. The average vehicle costs per truck for the City are approximately $16,000. R. W. Beck would also note that the per vehicle costs for the new vehicles are less than for the older style of vehicle, which is likely due to the age of the vehicles. R. W. Beck would expect that, as the new trucks age, the average annual cost per vehicle will be closer to $20,000, but still below average compared to other vehicle types.

Staffing

The City has nine full-time recycling drivers that run the daily curbside recycling routes. There is one crew leader that acts as supervisor of this staff as well as three relief drivers that are shared across the all of the City's various collection operations (e.g., residential refuse, yard waste, commercial front load). Because the relief drivers are shared across the system as a whole, staffing of the curbside recycling program

cannot be analyzed without taking into account the entire system. The table below shows the number of full-time equivalent (FTE) drivers and crew leaders that are employed in the City's residential and commercial collection system.

Table 2-8
Collection System Staffing Summary

Program	Drivers (FTE)	Crew Leaders (FTE)
Residential Recycling	9	1
Residential Collection [1]	12	1
Commercial Front-Load (Refuse & Recycling)	7	1
Commercial Roll-Off [2]	1	0
Relief Drivers	3	0
TOTAL	32	3

1. Includes refuse, yard waste, and bulky collection.
2. One crew leader supervises the commercial front-load and roll-off operations.

Overall, the City employs 32 FTE drivers and three FTE crew leaders. Three of the 32 drivers are the relief drivers that are shared across the system. Therefore, the ratio of back-up personnel to full-time personnel is approximately 10 percent.[9] Compared to other solid waste collection systems, this can be considered a lean operation. Most collection systems have back-up personnel ratios in the range of 15 to 20 percent, which, in the City's case, would result in approximately four to six relief drivers.

The City's drivers incur some overtime hours; however, all of the overtime incurred by the recycling staff is related to clean-up programs and staffing the compost site on Saturdays. Since this work is not related to the curbside recycling program, overtime is not an issue for curbside recycling.

R. W. Beck also evaluated the number of supervisors per route in the recycling operation. R. W. Beck recommends having one supervisor per every eight to 10 routes. Given the nine recycling routes, the current number of supervisors is adequate.

2.2.5 On-Route Operations

Routing

The City designs its routes for recycling collection manually, and the last time the routes were reconfigured was approximately three years ago. To address route balancing issues, City staff redesigned the recycling routes in August 2008. Based on discussions with City staff, this reroute should positively benefit collection efficiency.

[9] 3 relief drivers/29 FTE drivers = 10.3%

On-route Collection Practices

Recycling drivers are required to hand-sort recyclable materials that are set out by residents into 10 different compartments on the recycling truck. The drivers place the bins onto a ledge on the side of the truck to make for easier sorting (see Figure 2-3). The sorting process is very physically demanding and time intensive. For instance, during R. W. Beck's route observations, it took drivers between 20 and 90 seconds to collect individual stops.

Figure 2-3: Sorting Process

R. W. Beck would emphasize that the recycling truck drivers exhibit an extraordinary level of effort in collecting and sorting the recyclable material. The sorting demands of the City's program are among the highest of any program evaluated by R. W. Beck. The City's drivers are very efficient in their sorting and contribute a great deal to the overall success of the program.

Because of the physical demands of the City's program, it will be imperative for supervisors to continue to place an emphasis on safety. During R. W. Beck's site visit, it was noted that drivers are encouraged to take breaks and stay hydrated while on route, and are provided with energy drinks and water coolers.

Set-Out Policies

City residents set out commingled recyclables for collection in 18-gallon bins. The City encourages, but does not require, residents to separate materials by commodity. A properly separated set out will include broken down OCC and chipboard under the bin, newspaper and mixed paper in paper bags, and all other materials in the bin. The City makes vinyl bags available for residents to purchase for separating paper products, as shown in Figure 2-4.

Drivers have the responsibility of leaving tags on the recycling bins of residents that do not participate properly. Residents can receive tags for setting out contaminated or otherwise unacceptable material, as well as other various reasons. Drivers also have the ability to not collect unacceptable material, providing for a recyclable stream with very low contamination rates.

Figure 2-4: Large Recycling Set-Out in Fayetteville

Residents may also set out an unlimited number of bins. Residents are provided with one bin and may purchase additional bins for a one-time charge of $7.50. Many residents have more than one bin. On some occasions, set outs can be large, as shown in Figure 2-4.

However, if material is pre-sorted by residents, even very large set outs can be sorted very quickly and efficiently by the driver. R. W. Beck recommends that the City develop specific public education strategies to encourage residents to pre-sort material.

2.2.6 Collection Efficiency

The City collects recyclables at curbside using nine, front-line vehicles with one driver per vehicle. These nine vehicles are run four days of the week for a total of 36 recycling routes. The work day is 10 hours long for the drivers; however, the City has a task-based incentive program that ensures that drivers are paid for 40 hours per week regardless of the time that it takes to complete the routes. Due to this incentive program, the recycling drivers work approximately nine hours per work day due to not taking their full breaks or lunches.[10]

In order to conduct the collection efficiency analysis, R. W. Beck made assumptions about the non-collection time (e.g., travel, down time, breaks) for the recycling routes. These assumptions are based on discussions with staff as well as field observations.

- Round trip travel time from the Transfer Station to the route – 20 minutes
- Pre-and-post-trip inspections (includes all post-route duties) – 30 minutes [11]
- Breaks – 20 minutes based on two 10 minute breaks [12]

[10] R. W. Beck recognizes that a nine hour work day for the drivers results in a 36 hour work week (9 hours*4 days per week = 36 hours per week). However, this situation is relatively common for cities that have task-based systems as well as cities that have physically demanding programs. R. W. Beck would expect that, if the City were to implement a semi-or-fully-automated recycling program that the drivers would be expected to work the full 40-hour work week.

[11] R. W. Beck assumed that pre-trip and post-trip inspections last an average of 15 minutes each.

- Number of daily disposal trips – 1.5 trips
- Unloading material – 15 minutes

R. W. Beck used Minneapolis as the primary benchmark for collection efficiency. Table 2-9 summarizes key collection efficiency measures for the two programs.

Table 2-9
Collection Efficiency Measures

Measure	Fayetteville	Minneapolis
Length of collection day	10 hours	8 hours
Collections per route hour	75 households	74 households
Average route size	523 households	361 households
Average set-outs per route	293 households	218 households
Hours spent not collecting per route [1]	3.0 hours	2.9 hours
Collection efficiency ratio [2]	70%	61%

1. Based on assumptions listed in the bulleted list above.
2. The collection efficiency ratio is the percentage of the work day that is spent performing on-route collections, net of MRF trips, pre and post trip inspections, lunches, breaks and breakdowns.

The two communities have very similar collection operations, with similar truck styles, and both have high recovery rates. The key difference between the two operations is that Minneapolis operates on a five day work week with drivers working eight hours per day.

The City's curb-sort collection system operates at a very similar production level as the collection operation in Minneapolis. Fayetteville drivers are able to collect 75 homes per hour of pure route time and Minneapolis drivers are able to collect 74 homes. However, the City of Fayetteville is able to have larger routes due to the 10 hour per day, four day per week work schedule.

The City's current curb-sort collection system has many advantages, such as low material contamination and minimal processing costs. However, curb-sort collection systems have low collection efficiency compared to more automated collection systems. For instance, in a fully automated, cart-based collection system, drivers can collect between 125 and 150 homes per hour. Because curb-sort recycling programs are relatively uncommon and vary considerably between communities, it is challenging to assess the maximum collection efficiency for Fayetteville. However, R. W. Beck considers 75 homes per hour to be a reasonable production level given constraints of the curb-sort system.

R. W. Beck conducted an analysis to determine if there is excess capacity in the City's nine collection routes. Based on R. W. Beck's analysis, the City needs eight recycling routes for its operation, as opposed to the current nine routes. The following table summarizes this analysis.

[12] As a result of the incentive program for recycling drivers, many drivers do not take their full breaks during the work day. However, for the purpose of this analysis, R. W. Beck assumed that drivers take an average of 20 minutes of break time per day.

Table 2-10
Recycling Collection Capacity Analysis

Route Size Analysis	Unit	Routes Needed Analysis	Unit
Pure route time [1]	8.0 hours	Collections per week	18,830 homes
Collections per hour	75 homes	Collections per day [3]	4,708 homes
New route size [2]	600 homes	Routes needed [4]	7.85 routes

1. Based on a 10 hour work day.
2. 8.0 hours*75 homes per hour = 600 homes
3. 18,830 homes/4 days per week = 4,708 homes per day
4. 4,708 homes/600 homes per route = 7.8 routes

Based on the analysis summarized in the above table, the City needs approximately eight routes to operate the collection system.[13] In order to address this excess capacity, the City has two options. The first option would be to reduce the number of routes by one route. The second option would be to make a concerted effort to increase the amount of material collected on the existing routes, which would increase the amount of time needed to complete the routes.

The primary benefit of reducing the number of routes is the cost savings associated with that route. R. W. Beck conducted an analysis of the cost per route for the recycling collection operation in order to assess the potential cost savings for reducing one route. This analysis is summarized in Table 2-11.

Table 2-11
Cost per Recycling Route

Item	Cost
Labor Costs (1 driver)	
Salary	$30,383
Benefits	$10,649
Subtotal	$41,032
Vehicle Costs (1 truck)	
Repairs	$6,288
Maintenance	$565
Fuel	$5,657
Shop Overhead	$3,645
Replacement	$20,913
Subtotal	$37,068
Total Cost per Route	$78,100

The second option for the City to eliminate the excess capacity in the routes is to make a concerted effort to increase the amount of material collected. This option also

[13] There may be a need to add routes in the future in order to accommodate growth in the City.

carries financial benefits in that every additional ton of material received represents additional revenue to the program. R. W. Beck recommends the City pursue this option in order to eliminate excess capacity in the residential recycling routes.

2.3 Processing Operation

The City operates a MRF that is located adjacent to the refuse transfer station. At the MRF, City crews bale source separated material and store it until it is sold to market. The following table summarizes the tons of material processed at the MRF for the past three years from the City's recycling programs.[14]

Table 2-12
Annual Material Processed [1]

Material	Average Composition [2]	2005 (Tons)	2006 (Tons)	2007 (Tons)
Aluminum	1.1%	67	79	82
HDPE	2.8%	110	130	136
PET	2.5%	157	186	194
Steel Cans	2.2%	138	164	171
#6 Newspaper	13.6%	843	1,000	1,044
OCC	18.8%	1,165	1,382	1,443
Chipboard	14.4%	891	1,058	1,104
#8 Newspaper	29.8%	1,847	2,191	2,288
Total	85.2% [3]	5,218	6,190	6,463

1. Includes tonnage from curbside recycling, community drop off, commercial OCC, igloos, and in-house recycling. Glass is excluded because it is not processed at the City's MRF.
2. The average material composition shown in this table is slightly different than the composition shown in Table 2-3. This is because this table accounts for commercial OCC, whereas Table 2-3 does not account for commercial OCC.
3. This composition does not include glass. Glass is not processed in the MRF but is direct hauled in roll-offs to Dlubak processing facility in Okmulgee, OK.

2.3.1 Facility and Equipment

Facility

The City's MRF consists of an indoor area that houses the processing equipment (baler), a tipping floor, loose fiber storage, and baled fiber storage.[15] There is also outdoor baled material storage and an outdoor tipping area for all non-fiber materials. Figure 2-5 is a schematic diagram that provides an understanding of the general site layout as well as material and vehicle flow through the facility.

[14] Glass is not included in the table because glass is not processed at the City's MRF.
[15] Chipboard, OCC, newspaper #6 and newspaper #8 are all stored inside the MRF building in order to keep the material dry.

When recycling trucks come to unload materials at the MRF, the driver first pulls into the indoor area to unload fiber materials, including newspaper and OCC, into the loose material storage bins (see #1 in Figure 2-5). The driver will then drive onto the concrete pad (see #2 in Figure 2-5). On the concrete pad, the driver unloads glass, steel cans, and aluminum cans into 40 CY roll-off containers. Last, on the way out of the facility, plastics #1 and #2 are unloaded off of the side of the recycling vehicle into 40 CY roll-off containers (see #3 in Figure 2-5).

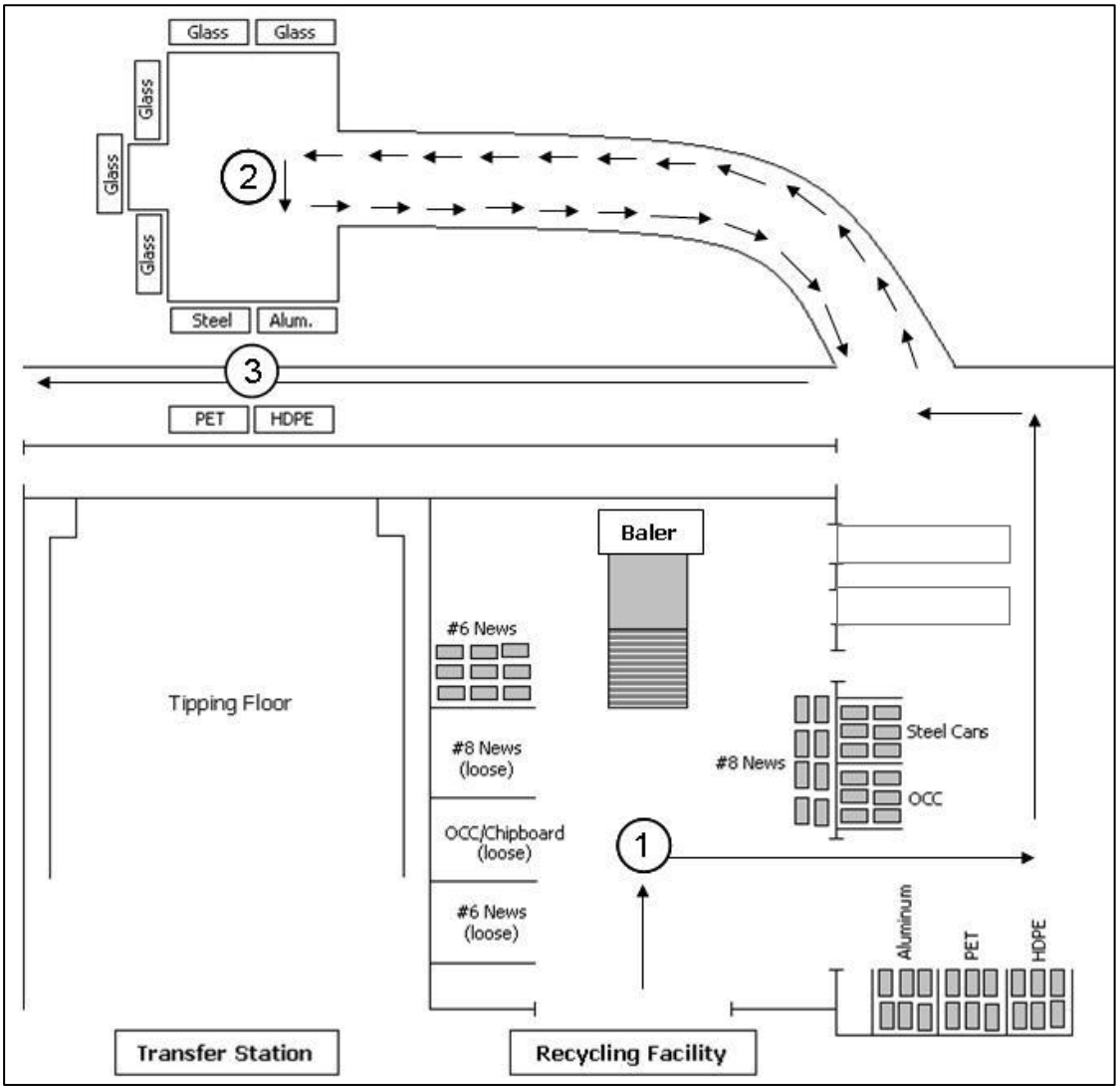

Figure 2-5: Schematic diagram of MRF (*figure not to scale*)

Photographs of the City's MRF can be found in Appendix A.

Material Flow

The MRF operators bale one material at a time based on the needs and schedule of the particular work day. Loose material that is stored in roll-off containers may be emptied directly onto the tipping floor. These containers are pulled from the concrete pad as well as the community drop-off area on an as-needed basis.

To bale fiber materials that are stored indoors, a MRF operator uses the skid steer to load the fiber materials into the pit. Based on R. W. Beck's observation, the MRF operator will either scoop or grab material using the skid steer's combination bucket in order to move it onto the tipping floor and into the pit.

The current method of moving fiber materials from the storage bins into the pit requires a considerable amount of material handling by the MRF operator. The most efficient way to move material from the storage bins into the pit would be to push material directly into the pit using the skid steer. If the MRF operators were able to push material directly into the pit, it would reduce the handling time associated with scooping and grabbing the material with the skid steer combination bucket. However, the current layout of the MRF does not allow the material to be pushed from the storage bins into the pit. R. W. Beck emphasizes that the inefficiencies associated with this issue are minor. In addition, the required modifications to the facility that would address this issue would be considerable. Therefore, R. W. Beck does not recommend that the any modifications be made at this time to allow material to be pushed directly from the storage bins into the pit.

Expansion Potential

The MRF is of adequate size and processing capacity to operate at the City's current tonnage level. However, as tonnage increases over time, the primary constraints within the facility will be bale storage and loose material storage. Due to the recent installation of City sewer lines across the property, it may not be feasible for the building to expand in the future. If there is a need for a future expansion, the City would need to evaluate the impact on the sewer lines.

Equipment

Table 2-13 lists the equipment that is used in the MRF.

Table 2-13
Processing Facility Equipment

Unit	Description	Year	Type
# 5793	Nexgen Baler	2008	Processing equipment
# 454	Mack Crane/Roll-off	1999	Rolling stock
# 660	Bobcat Skid Steer Loader	2005	Rolling stock
# 9058	Nissan Forklift	2005	Rolling stock

The City's baler was purchased in 2008. The baler appears to be in good working condition and is satisfactory for the City's current, source-separated recycling program. However, should the City transition to a different style of program (e.g., dual stream or single stream collection) there would be a need for additional processing equipment.

As summarized in the table, the MRF rolling stock consists of a roll-off truck, a skid steer loader, and a forklift. The roll-off truck is used primarily to pull the roll-off containers from the concrete pad and the community drop-off to the tipping floor. The

skid steer loader is used to move loose material from the storage bins to the pit as well as push material from the tipping floor into the pit. The forklift is used to move bales from the baler to the proper storage location as well as to load bales into trucks when material is sold.

Based on R. W. Beck industry experience, the City has sufficient rolling stock and processing equipment to operate the current system in an efficient manner.

2.3.2 Operations

Staffing

The MRF is staffed by three operators and one crew leader. Each of these four staff is a full time employee of the City; however, these individuals spend half of their time in the composting operation.[16] Therefore, the MRF is staffed by two FTE employees.

During R. W. Beck's site observations, these four staff generally performed the following tasks:

- Operating the baler
- Operating the skid steer
- Operating the forklift
- Other tasks, including: monitoring incoming material and removing contaminants, maintaining general site cleanliness, directing incoming loads, etc.

It is R. W. Beck's general recommendation that the MRF operators specialize in certain roles while operating the MRF in order to maximize efficiencies associated with developing expertise in specific tasks. However, R. W. Beck recognizes that there may be limited opportunity for this type of system given the nature of the shared staff between two operations.

R. W. Beck considers the current level of staffing to be adequate for current MRF operation. However, should the City significantly increase the amount of material processed at the facility, there may be a need to allocate the four staff solely to the MRF operation and maintain separate staff for the composting operation.

Capacity

As shown in Table 2-12, the MRF processed 6,463 tons of material in 2007. R. W. Beck conducted an analysis to determine the projected 2008 utilization of the baler based on a 40 hour work week. For this analysis, R. W. Beck assumed that the tonnage level remained constant from 2007. The weighted average material density of the stream of materials processed by the MRF is 5.6 pounds per cubic foot (lbs/CF). The baler can process approximately 10.3 tons per hour of material at this density.[17]

[16] The crew leader for the MRF is also the composting crew leader.

[17] Source: Nexgen Baler specifications included in bid documents prepared by Downing Sales and Service, Inc. for the City of Fayetteville.

Assuming that the baler processes 10.3 tons of material per hour, R. W. Beck would expect the baler to be utilized for 627 hours in 2008.[18] These 627 operating hours represent a 30 percent utilization rate given a 40 hour work week.[19]

The City has excess capacity in the processing system and could process significantly more material. Based on discussions with City staff, the MRF operators spend approximately half of their time performing responsibilities other than material processing. If the material quantities accepted at the MRF were to increase, there could be a need to adjust staffing, but the processing equipment would have the capacity to process more material.

2.3.3 End Markets

R. W. Beck conducted an end markets analysis to assess the competitiveness of the market prices that the City received for its materials in 2007. Table 2-14 compares the average selling price to the average regional index price for each material. In addition, Table 2-14 includes the assumed value of material going forward, as discussed in Section 1.

Table 2-14
2007 Price Comparison (per ton)

Material	Average Composition	Avg. 2007 Price	Avg. 2007 Index	Diff	Assumed Value	Index
Aluminum	1.3%	$1,727	$1,670	3.4%	$1,509	Waste News [1]
HDPE (mixed) [2]	2.2%	$531	$555	-4.3%	$380	Waste News
PET	3.1%	$348	$340	2.4%	$217	Waste News
Steel Cans	2.7%	$147	$193	-24.2%	$169	Waste News
Green Glass	4.5%	$25	$7	240.8%	$24	Waste News
Clear Glass	6.5%	$50	$27	83.8%	$50	Waste News
Brown Glass	8.5%	$35	$18	98.6%	$35	Waste News
#6 News	16.8%	$57	$65	-11.6%	$34	OBM [3]
OCC/Chipboard	17.7%	$129	$99	30.3%	$60	OBM
#8 News	36.7%	$87	$97	-10.3%	$86	OBM
Weighted Average		$121	$118	2.8%	$95	

1. Index is Waste News Secondarymaterialspricing.com, all prices shown are from the South Central region (Houston, TX).
2. R. W. Beck took an average of the index prices for HDPE colored and HDPE natural to develop a comparable index price for the City's stream of mixed HDPE plastic.
3. Index is Official Board Markets for the Southwest region. R. W. Beck used first week of the month pricing.

Overall, the City received a 2.8 percent premium price to the regional market for recyclable materials in 2007. This is primarily based on the following factors:

[18] Assumes no material increase over 2007 tonnage.
[19] 627 hours/2,080 working hours per year = 30% utilization

- Due to the source separated nature of the City's program, the materials sold have extremely low contamination.
- The City puts each load of material (with the exception of glass and fibers) to bid among several different brokers. This enables the City to receive competitive market prices for each load of material that is sold.
- For OCC, the most prevalent material in the City's stream, the City received market prices that were significantly higher than the index price.

For aluminum, HDPE, and PET, the City received prices consistent with the index. However, for the following materials, the City received prices lower than the indices:

- Newspaper – The City received prices for newspapers #6 and #8 that were approximately 10 percent lower than the regional index. R. W. Beck would expect that a key reason for this is that residents commingle other grades of paper (e.g., junk mail, mixed paper, magazines) with newspaper. This commingling likely results in a discounted market price.
- Steel – The City received prices for steel that were approximately 25 percent lower than the index price. R. W. Beck would emphasize that, because steel is a relatively insignificant portion of the City's recyclables stream, this price differential does not have a significant detrimental impact on the overall price received for recyclables. R. W. Beck would expect that the City receives lower prices for this commodity due to distance from the primary end users.

Additionally, there are several materials for which the City is receiving a premium price to the relevant indices.

- Glass – The City receives prices for glass that are significantly higher than the regional index. In fact, the City receives a premium to the index price of approximately 241 percent for green glass, 84 percent for clear glass, and 99 percent for brown glass. The cost to haul glass from the City's MRF to the glass processing facility is $30 per ton. The price received for green glass is $25 per ton, which does not fully offset hauling costs. However, this slight deficit is offset by the very high prices received for clear and brown glass.
- OCC – The City receives approximately a 30 percent premium price for its OCC. R. W. Beck expects that the City's competitive bidding process as well as the high quality of the collected material contribute to this premium.

2.4 Cost of Service for Curbside Recycling

R. W. Beck conducted a cost of service analysis specific to the curbside recycling program for the City of Fayetteville. R. W. Beck utilized annual budget data that was provided by the City to conduct this analysis.

R. W. Beck was able to isolate many of the curbside recycling costs from the costs to operate the other recycling programs. (e.g., curbside truck costs). However, some costs are shared among all of the City's recycling programs (e.g., MRF operating costs). For costs that are shared among all of the recycling programs, R. W. Beck

allocated those costs to the curbside recycling program on a tonnage basis. In other words, since curbside recycling represents 71 percent of the City's recycling tonnage, 71 percent of the shared recycling costs were allocated to the curbside program.[20]

One of the most significant costs to the curbside recycling program is personnel. Personnel costs are summarized in Table 2-15. For each staff position, R. W. Beck calculated the average salary and benefits costs. In addition, 71 percent of the cost for the waste reduction coordinator, MRF operators, and MRF crew leader was allocated to the curbside program for the cost of service analysis.

Table 2-15
Curbside Recycling Staff Average Compensation

Position	Salary	Benefits	Total	Recycling FTEs	Curbside Allocation
Waste Reduction Coordinator	$48,680	$16,226	$64,906	0.5	71%
Collection Crew Leader	$40,972	$12,389	$53,361	1.0	100%
Truck Driver	$30,383	$10,649	$41,032	9.0	100%
Relief Driver	$34,693	$6,239	$40,932	0.8	100%
MRF Operator	$30,383	$10,649	$41,032	1.5	71%
MRF Crew Leader	$39,073	$17,808	$56,881	0.5	71%

Vehicle costs also have a significant impact on the cost of service for curbside recycling. For the cost of service analysis, R. W. Beck utilized the vehicle cost information that is summarized in Table 2-7.

Table 2-16 summarizes the curbside cost of service. As shown in the table, the City's curbside program costs $5.88 monthly on a per household basis. R. W. Beck allocated the cost of service for the curbside program into three categories, as follows:

- Collection costs
- Processing costs
- Program administration (e.g., waste reduction coordinator salary, printing, general materials and supplies, insurance, etc.)

Of the total cost of service, $4.23 was allocated to the collection operation, $1.18 to the processing operation, and $0.48 to program administration.

Because of the great variability in curb-sort program design, cost of service can vary considerably. In addition, because of the level of effort and analysis required to calculate cost of service for specific programs, many cities do not have current cost of service information. Therefore, R. W. Beck does not have an extensive database of curb-sort program cost of service against which to compare the City's cost of service.

[20] A detailed analysis of the City's recycling programs and tonnage can be found in Section 1.

Table 2-16
Curbside Recycling Cost of Service

Account	Collection	Processing	Program Administration	Total
Personnel	$455,390	$63,891	$23,042	$542,323
Materials and supplies [1]	$123,994	$24,850	$14,692	$163,536
Services and charges [2]	$0	$27,264	$61,034	$88,298
Vehicle Costs	$376,920	$38,278	$8,817	$424,015
Maintenance [3]	$0	$4,428	$0	$4,428
Capital [4]	$0	$9,230	$0	$9,230
Depreciation [5]	$0	$97,926	$0	$97,926
Cost of Service	$956,304	$265,867	$107,585	$1,329,756
Per household (monthly)	*$4.23*	*$1.18*	*$0.48*	*$5.88*

1. Includes items such as office supplies, printing, cleaning supplies, minor equipment, chemicals, and recycling containers.
2. Includes insurance, contracted services and cost allocation.
3. Includes all maintenance that is not through fleet services.
4. Includes any solid waste improvements.
5. Depreciation excludes vehicles.

The cost of service for the City's program is considerably higher than what R. W. Beck would expect in a dual- or single-stream program. Programs that allow more commingling can cost between $1.50 and $3.00 per household on a monthly basis. However, the cost of the program is partially offset if revenue from material sale and disposal cost avoidance are taken into account. The assumed value of the material on a per ton basis is $95, as shown in Table 2-14. The disposal cost avoidance is based on the City's current disposal rate of $24.47, as opposed to a previous rate of $32.00 per ton. If the City would pay a higher disposal rate in the future, it would further increase the cost avoidance from disposal fees Table 2-17 provides a summary of this analysis.

Table 2-17
Net Cost of Service

Net Cost of Service	Total Cost	Per Household
Total cost of service	$1,329,756	$5.88
(Less) Revenue from material sale	($524,685)	($2.32)
Cost of Service	$805,071	$3.56
(Less) Disposal cost avoidance	($135,148)	($0.60)
Net cost of service	$669,923	$2.96

As shown in Table 2-16, the cost to operate the City's MRF is $265,867 annually. The MRF processed 6,463 tons in 2007 as shown in Table 2-12. Therefore, the cost per ton to process material at the City's MRF is $41.

2.5 Policy Issues

Variable Rate Structure

The City has a variable rate structure for residential refuse in which residents can choose between three sizes of refuse carts. The cart sizes are associated with the following monthly charges:

- 32 gallon – $8.75 per month
- 64 gallon – $13.35 per month
- 96 gallon – $18.96 per month

The City has implemented an effective enforcement plan for the variable rate program. Residents receive extra bag stickers at the beginning of each year that they may use at any time for an extra bag of waste. Any bag that that is placed outside of the cart that does not have an extra bag sticker is charged to the resident at $6.00 per bag. Additionally, if the resident's cart lid is open at all, the resident is charged for each bag that is visible to the driver.

The enforcement of the variable rate program benefits the residential refuse collection efficiency because it minimizes out-of-cart set outs in which drivers must get out of the truck to collect extra bags of waste. Also, the variable rate program encourages residents to recycle in order to decrease their monthly solid waste bill.

Ordinances

The City's recycling program does not require participation from residents, which is consistent with what R. W. Beck sees in most other municipalities. Instead of mandating participation, the City encourages participation through its variable rate refuse program. Because of the variable rate structure, R. W. Beck does not see a need for implementing mandatory recycling ordinances at this time.

2.6 Public Education

The City uses several methods for public education for residents:

- **On-route public education:** Drivers have tags that they can leave on recycling bins when residents set out materials improperly or set out contaminated materials. R.W. Beck observed drivers using tags very effectively during route observations.
- **Customer service staff:** The City has a customer service staff that responds very thoroughly and effectively to customer issues and questions that arise. During R. W. Beck's site visit, the customer service staff was observed giving detailed explanations of the recycling program.
- **Public speaking and tours:** City staff members conduct public speaking about the recycling program at schools and other public events. Staff members also conduct tours of the MRF.

- **Literature:** The City has several brochures and pamphlets that are available to residents at the solid waste offices, via mail, and via e-mail. These documents are provided to new customers when they sign up for utility services. The City also sends a solid waste newsletter with program information to all residents once per year. In addition to these materials, the City provides direct mailers once per year and periodic mailers to residents that call for customer service needs.
- **Media:** The local newspaper features periodic spots about recycling.
- **Website:** The solid waste website contains information about the recycling program and how to participate.

With the exception of the recycling bin tags, most of the City's public education efforts have targeted the City as a whole. R. W. Beck recommends that the City begin to develop more targeted public education efforts in order to gain more participation and get more material from residents that do participate.

2.7 Key Findings and Recommendations

Following are R. W. Beck's key findings and recommendations related to the current curb-sort recycling program. R. W. Beck emphasizes that the analysis in this section focuses on the current recycling system; subsequent sections of this report will analyze options to increase material recovery and decrease costs by transitioning to a different type of recycling program.

2.7.1 Curb-Sort Program Demonstrates Strong Performance

Based on material recovery rates and the quality of collected material, the City's curb-sort program has demonstrated very strong performance compared to other municipal recycling programs. In the course of the analysis, R. W. Beck found the following:

1. **On a per household basis, the City's residents are recycling 587 pounds of material annually, which is comparable to material quantities generated in some well-established dual-and-single-stream programs.**
2. **Based on experience in the Southwest region of the United States, R. W. Beck would assess the City's residential recycling rate as one of the highest in Arkansas, Texas, and Oklahoma.** Additionally, compared to major cities participating in the Waste News 2007 municipal recycling survey of the 30 largest cities in the United States, only San Diego, San Jose, Seattle, and Portland had higher residential recycling rates than Fayetteville.
3. **The curb-sort program has minimal contamination, as drivers inspect material at the point of collection.** Drivers have the ability to not collect contaminated material.
4. **There is a recent trend in many single-and-dual-stream programs toward including expanded varieties of plastic, such as plastics #3 through #7.** Due to the limited amount of space on the vehicle, as well as the high value of most of the commodities that are currently included in the program (relative to plastics #3-#7),

R. W. Beck would not recommend that the City consider including plastics #3 through #7 at this time.

2.7.2 Opportunities Exist to Increase Material Recovery by Increasing Participation

R. W. Beck found that the City's program has a set-out rate of approximately 56 percent. This set-out rate is slightly lower than what R. W. Beck would expect given the strong material recovery rate of the program. The strong material recovery rate coupled with the lower than expected set-out rate suggests that program participants recycle large quantities of material, but that there are many residents that do not participate at all. However, this hypothesis cannot be confirmed with participation rate data. Based on these findings, R. W. Beck recommends the following:

1. **The City should collect participation rate data.** The participation rate data collection effort should occur over one month in order to capture all of the households that participate in the recycling program. An auditor, as opposed to a driver, should collect this data. Drivers can record set-out data while collecting their routes, but should primarily focus on collection efforts while on route.
2. **Use data to target areas with low participation with educational and promotional efforts.** The City's public education efforts are currently focused on reaching the City as a whole. With participation information, the City will be able to focus its efforts on specific geographic areas with low participation in recycling. Some options for educational and promotional efforts include:
   - Provide a trial period for residents to try a smaller refuse container for one month without charging a fee to switch back to the larger container.
   - Run a door-to-door campaign for recycling in a particular neighborhood providing information on how to participate as well as recycling bins to those residents that do not have them.
   - Visit schools, neighborhood associations, community centers, and other organizations in non-participating areas.
   - Develop campaign messages that appeal to the particular demographics of non-participating geographic areas.
3. **Use participation rate information to determine the correlation between refuse cart size and recycling participation.** This information can be used to assess the effectiveness of the variable rate refuse program.

2.7.3 Collection Efficiency is Reasonable Given the Manual Nature of the Curb-sort Program

The City's drivers collect approximately 75 homes per hour on-route. R. W. Beck considers 75 homes per hour to be a reasonable production level given constraints of the current collection system. The City's current curb-sort collection system has many advantages, such as low material contamination and minimal processing costs.

However, low collection efficiency is the primary disadvantage of curb-sort collection systems. For instance, in a fully automated, cart-based collection system, drivers can collect between 125 and 150 homes per hour. In the course of the analysis, R. W. Beck found the following:

1. **The recycling truck drivers exhibit an extraordinary level of effort in collecting and sorting the recyclable material.** The sorting demands of the City's program are among the highest of any program evaluated by R. W. Beck. The City's drivers are very efficient in their sorting and contribute a great deal to the overall success of the program.
2. **The City's curb-sort collection system operates at a very similar production level as the collection operation in Minneapolis.** Fayetteville drivers are able to collect 75 homes per hour of pure route time and Minneapolis drivers are able to collect 74 homes. However, the City of Fayetteville is able to have larger routes due to the 10 hour per day, four day per week work schedule.

The inefficiencies associated with the collection system are due to program type rather than inefficient operation by the City. Therefore, opportunities to increase collection efficiency are limited. However, R. W. Beck recommends the following to increase collection efficiency.

3. **The City should develop specific public education strategies to encourage residents to pre-sort material at curbside.** For instance, the City can develop a flyer for the drivers to leave at households that do not pre-sort. The flyer can include a photo of the truck, a description of the sorting process, and an explanation of proper pre-sorting. Even very large set outs can be sorted quickly and efficiently if residents pre-sort material.
4. **The City should address excess capacity in its recycling routes by increasing the amount of material collected.** Placing an emphasis on increasing the amount of material recovered through the program will eliminate this excess capacity.

2.7.4 Limited Opportunities Exist to Reduce Collection Costs

On a per household basis, the City's collection operation costs $4.23 per month. This is significantly higher than the typical cost associated with dual-or-single stream collection programs. However, the high cost of the City's program is due to the type of program and not inefficient operation of the program. Therefore, opportunities to reduce collection costs are limited. However, R. W. Beck provided the following key findings regarding the curb-sort recycling collection system.

1. **Vehicle costs for the City's recycling trucks are on the low end of what is typically incurred by other types recycling vehicles (e.g., rear-loading and fully-automated).** The City's trucks have fewer moving parts than typical recycling vehicles, such as compacting mechanisms and automated arms. In addition, recyclables are lighter than refuse, meaning that the trucks are required to handle much less weight on a daily basis. For a typical, rear-loading collection vehicle, annual vehicle costs are around $25,000 per vehicle. The average vehicle costs per truck for the City are approximately $16,000. R. W. Beck would expect

that, as the new trucks age, the average annual cost per vehicle will be closer to $20,000, but still below average for other vehicle types.

2.7.5 MRF Facility and Equipment is Adequate for the Current Recycling Program

The MRF is of adequate size and processing capacity to operate at the City's current tonnage level. R. W. Beck also evaluated the City's processing equipment. The following lists R. W. Beck's key findings and recommendations regarding the MRF and the processing equipment.

1. **The baler appears to be in good working condition and is satisfactory for the City's current, source-separated recycling program.** However, should the City transition to a different style of program (e.g., dual stream or single stream collection) there would be a need for additional processing equipment.
2. **The City has sufficient rolling stock and processing equipment to operate the current system in an efficient manner.**
3. **The City is currently operating the baler at 30 percent utilization.** It is difficult to determine the maximum utilization of the baler that is possible in the City's system. However, R. W. Beck would note that the City has excess capacity in the processing system and could process significantly more material.
4. **The current layout of the MRF does not allow the material to be pushed from the storage bins into the pit.** The current method of moving fiber materials from the storage bins into the pit requires a considerable amount of material handling by the MRF operator. The most efficient way to move material from the storage bins into the pit would be to push material directly into the pit using the skid steer. If the MRF operators were able to push material directly into the pit, it would reduce the handling time associated with scooping and grabbing the material with the skid steer combination bucket. R. W. Beck emphasizes that the inefficiencies associated with this issue are minor. In addition, the required modifications to the facility that would address this issue would be considerable. Therefore, R. W. Beck does not recommend that the any modifications be made at this time to allow material to be pushed directly from the storage bins into the pit.

2.7.6 Material Selling Prices Exceed Indices

Overall, the City received a 2.8 percent premium price to the regional market for recyclable materials in 2007. The high quality of the City's material and competitive bidding process contributed to the high prices received. R. W. Beck highlights the following key findings and recommendations related to end markets for recovered materials.

1. **For aluminum, HDPE, and PET, the City received prices consistent with the relevant index.**
2. **For newspaper, the City received prices that were approximately 10 percent lower than the regional index.** R. W. Beck would expect that a key reason for

this is that residents commingle other grades of paper (e.g., junk mail, mixed paper, magazines) with newspaper.

3. **The City should make an effort to maximize the amount of newspaper that is sold as #8 rather than #6.** Newspaper #8 is generally a higher quality product, resulting in a higher price paid for the material.

4. **The City received prices for steel that were approximately 25 percent lower than the index price.** R. W. Beck would emphasize that, because steel is a relatively insignificant portion of the City's recyclables stream, this price differential does not have a significant detrimental impact on the overall price received for recyclables. R. W. Beck would expect that the City receives lower prices for this commodity due to distance from the primary end users. R. W. Beck would recommend that the City investigate with its material brokers and buyers the reason for the lower than expected price for steel.

5. **The City receives prices for glass that are significantly higher than the regional index due to the relatively close proximity to a glass processing facility.** In fact, the City receives a premium to the index price of approximately 241 percent for green glass, 84 percent for clear glass, and 99 percent for brown glass. The cost to haul glass from the City's MRF to the glass processing facility is $30 per ton. The price received for green glass is $25 per ton, which does not fully offset hauling costs. However, this slight deficit is offset by the very high prices received for clear and brown glass.

6. **The City receives approximately a 30 percent premium price for its OCC.** R. W. Beck expects that the City's competitive bidding process as well as the high quality of the collected material contribute to this premium.

Section 3
Opportunities for Public-Private Partnership

3.1 Overview

In evaluating options for the City's residential recycling program, R. W. Beck analyzed opportunities for the City to enter into a public-private partnership for recycling processing service. R. W. Beck conducted multiple interviews with private processing companies to assess the potential for a public-private partnership. The findings from this interview process served as the basis for developing cost estimates for recycling processing in Section 4 – Alternative Options Analysis.

3.2 Interviews with Private Processors

R. W. Beck identified and contacted seven recycling processing companies to assess private-sector interest in partnering with the City. These companies are listed below.

- Abitibi Bowater
- Allied Waste
- Greenstar
- Marck Recycling
- Pratt Industries
- Recycle America
- Roll Off Service

The companies identified include companies that currently have processing facilities in Northwest Arkansas as well as companies that potentially have an interest in developing a new facility in Northwest Arkansas. Additionally, some companies expressed interest in providing processing service to the City using an existing facility outside of Northwest Arkansas. These processing scenarios are discussed in more detail in Section 3.3.1.

Six of the seven identified companies responded and agreed to be interviewed by R. W. Beck. R. W. Beck asked representatives from each company a series of questions in order to understand how a partnership with the City could potentially develop. A list of the questions asked by R. W. Beck can be found in Appendix B.

R. W. Beck informed each company that some of the questions included in the interview could involve potentially sensitive and proprietary information. To address this issue, R. W. Beck assured each company that individual interview responses would be confidential. As such, the results from the individual interviews have been aggregated and are summarized in the remaining portions of this section.

3.3 Interview Key Findings

R. W. Beck summarized the key findings from the private company interviews in terms of the categories listed below.

- Private sector interest in processing
- Project structure
- Financial terms
- Acceptable materials
- Recovery rate and contamination

3.3.1 Private-Sector Interest in Processing

All of the companies interviewed expressed some interest in developing a partnership with the City to provide recycling processing service. Companies expressed interest in providing processing service to the City by:

- Utilizing an existing facility in Northwest Arkansas;
- Developing a new facility in Northwest Arkansas; or
- Transporting material to an existing facility outside of Northwest Arkansas.

Several of the private companies emphasized the importance of reaching certain economies of scale when operating a MRF; the economies of scale are driven by the volume of material that would be processed. Specifically, companies that do not have existing processing facilities in the region explained that a certain level of tonnage would need to be reached in order to justify the capital investment required to develop a new facility. These companies estimated that a MRF would need to bring in between 75 and 100 tons per day (or 21,000 to 26,000 tons per year) in order to be financially viable. However, companies also stated that a facility could potentially be viable if the processor were able to source additional material from commercial customers and surrounding municipalities. Processors estimated that it would take between eight and 18 months to develop a new MRF.

While some companies expressed an interest in developing a new facility in Northwest Arkansas, some of the companies interviewed stated that the volumes in the region would not be enough to justify developing a new facility. The decision making and growth strategies of these processing companies are such that it would not allow them to develop a facility in a region with a relatively small population. However, these companies offered suggestions for alternative means of providing service to the City.

One alternative option suggested was to long-haul material to an existing MRF outside of Northwest Arkansas. This can be done by either loading material into a transfer trailer or by loading bales of commingled material into a semi-trailer for transport to the MRF. Several processors interviewed by R. W. Beck stated that both of these methods are currently being practiced. Challenges can occur with baled, commingled recyclables if there is a significant amount of contamination. Loose material is generally easier to process with an automated system but baled material is also

accepted at MRFs. It is important to note that, if material is transported in commingled bales, then glass cannot be included in the recycling program.

3.3.2 Project Structure

There are several types of agreements that the City could enter into with a private company. R. W. Beck discussed the interest that private companies would have in the following types of agreements:

- **Processing services agreement:** Processor develops a new facility or upgrades an existing facility to process recyclables; City contracts with facility for processing.
- **City ownership, private operation:** City owns the property and the building and either the City or the processor owns equipment; processor operates the facility.
- **Design, build, and operate:** The City owns the property for the MRF and contracts with a private company to design, build, and operate the facility. This scenario could include a number of variations which affect capital costs, such as rehabilitation of existing facilities and eventual transfer of ownership.

All of the companies interviewed by R. W. Beck expressed interest in at least one of the above partnership structures that may be considered by the City. R. W. Beck would expect that there would be interest by the private sector should the City pursue some type of public-private partnership through the procurement process.

As would be expected, companies with existing facilities expressed a preference for a processing services agreement that would utilize their existing facility or a facility that they would develop. However, the companies also clearly stated that they would have an interest in any type of partnership that the City would pursue. R. W. Beck emphasizes that the City should not limit its options by only focusing on companies that have existing processing facilities in the region, as companies without existing facilities expressed interest in partnering with the City. In addition, companies expressed a preference for long term contracts over shorter term contracts.

All of the companies interviewed expressed a general preference for private ownership over public ownership of processing facilities. However, companies are open to discussing and negotiating the project structure that makes the most sense for the City. R. W. Beck would note that, whether a facility is publicly or privately owned, it will be critical that the private company be able to source material from commercial sources as well as from sources outside the City. Achieving economies of scale in the MRF operation will increase the financial viability for the private operator as well as result in lower processing costs for the City.

3.3.3 Financial Terms

Based on discussions with the private processors, the City could expect a financial agreement with a processor to include both a processing fee per ton as well as a revenue sharing component, or rebate. All of the companies interviewed stated that a financial arrangement based on the formula shown in Figure 3-1 is reasonable and consistent with agreements being made with other cities.[1]

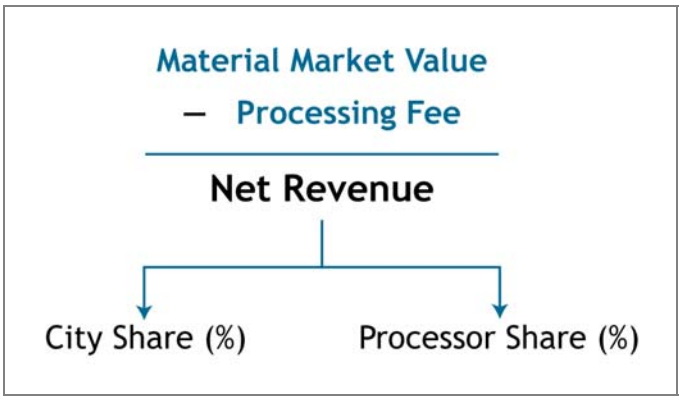

Figure 3-1: Probable Formula for Processing Contract Financial Terms

Several of the processors interviewed were able to give planning-level estimates of the processing fee that would be charged to the City. These companies estimated that the processing fees paid by the City would be between $30 and $40 per ton.

Several processors were also able to estimate the revenue sharing percentage that the City could expect to receive from the processor. The level of revenue sharing can vary based on a variety of factors, such as:

- **Quantity of material:** Generally speaking, cities with larger quantities of material are able to obtain more competitive revenue sharing percentages with processors.
- **Inclusion or exclusion of glass:** Because of its low value and limited marketability, processors may be willing to offer a premium revenue sharing percentage to cities that do not include glass in their program.
- **Distance between City and the processing facility:** If a particular MRF has excess capacity in its system, the processor may be willing to pay a premium to source material from cities outside of direct-hauling distance.

The processors interviewed provided estimated revenue sharing percentages between 40 and 70 percent. However, R. W. Beck would expect that the City would receive revenue sharing between about 50 and 60 percent due to the relatively low volume that would be generated. Specific revenue sharing estimates are discussed in more detail in Section 4.3.2.

[1] In developing a contract with a private company, the City would be able to ensure that there would be no adverse financial impact on the City in the event that the market value of materials were to fall below the cost of the processing fee.

3.3.4 Acceptable Materials

R. W. Beck presented all of the private processors with a list of the materials that are currently included in the City's curb-sort program. The companies interviewed did not foresee major challenges with processing the current material mix in a single- or dual-stream system. In addition to the current materials, most of the companies said that they would be able to include plastic containers #3 through #7 in the City's program. These containers include items such as shampoo bottles, cooking oil bottles, margarine tubs, yogurt tubs, and other similar containers. Non-container plastics #3 through #7 – such as plastic bags and polystyrene packing material (e.g., Styrofoam®) – would likely not be accepted.

In addition, glass is a material that can be challenging to process, especially in single-stream facilities. Based on discussions with the processors, R. W. Beck found that, although MRFs generally prefer not to accept glass, they are willing to work with cities to accommodate the needs of a particular program. Processors recognize the challenges associated with eliminating a material that has historically been included in municipal program. Therefore, it is very likely that the City will be able to include glass in a potential dual- or single-stream program. However, if glass is to be included in a program, the financial implications of that decision would need to be determined during the contract negotiation process.

In addition to discussing the types of material that would be accepted, R. W. Beck also asked the processing companies if they have a preferred method of collection for recyclable material (e.g., dual-stream or single-stream). All of the processors interviewed by R. W. Beck either currently operate a single-stream facility or plan to convert their facility to accept single-stream materials within approximately the next 12 months. Based on our discussions, if a facility is set up to sort single-stream materials, processors prefer to receive material in a single-stream.

3.3.5 Recovery Rate

The recovery rate of materials refers to the percentage of material processed that is captured by the processing equipment and sold to end users. The recovery rate of a MRF can be affected by both contamination and residuals.

- **Contamination:** Material that is collected that is not accepted by the MRF or included in the recycling program.
- **Residuals:** Refers to recyclable material that is not recovered by the MRF due to inefficiencies in the system. The residual rate is challenging to quantify, and residuals are typically included in the contamination rate.

R. W. Beck asked private companies what would be reasonable expectations for a recovery rate for a dual-stream and single-stream program. Most companies stated that a three to seven percent contamination rate is reasonable for a dual-stream program, while a 10 to 15 percent contamination rate is reasonable for a single stream program. Most processors agreed that, because of the City's record of extremely low contamination, it is reasonable to expect contamination rates to be low in a potential

dual- or single-stream program. In addition, public education can have a significant effect on decreasing contamination and maximizing recovery for a recycling program.

3.4 Recommendations

Listed below are R. W. Beck's recommendations based on the key findings from interviews with private processing companies.

1. **If the City were to pursue a public-private partnership for processing service, a Request for Proposals (RPF) for processing services should be written broadly and inclusively in order to allow all companies to compete, even those that do not currently have facilities in the region.** Interviews revealed that there is interest from the private sector in partnering with the City. Interested companies include those that do not currently have processing capabilities in the region. R. W. Beck recommends that, if the City issues an RFP for processing services, that the RFP be written very broadly to allow for companies to propose creative solutions to providing service. This will maximize the competitiveness of the procurement by allowing companies to participate that do not have facilities in the region.

2. **The City should favor single-stream over dual-stream.** All of the processors interviewed either currently have single-stream facilities or plan to convert their facilities to accept single-stream in the next 12 months. Additionally, the national trend in recycling programs is away from dual-stream toward single-stream. Depending on the outcome of the financial analysis in Section 4, the City should move toward single-stream recycling over time as they transition away from the current system.

3. **Regardless of public or private ownership, the City should allow and encourage any local MRF to source material from the commercial sector as well as from sources outside of the City.** MRFs achieve economies of scale based on the volume of material processed. If a MRF was able to maximize the amount of material accepted, it would result in improved financial performance as well as reduced processing costs for the City.

Section 4
Alternative Options Analysis

4.1 Overview

In this section, R. W. Beck provided an analysis of alternative options for the City to provide curbside recycling service to residential customers. R. W. Beck analyzed both collection and processing options. For collection, R. W. Beck estimated the costs associated with the following options:

- Dual-stream recycling, using 18-gallon bins
- Single-stream recycling, using 96-gallon rolling carts

The costs for these collection options were compared to the status quo system of curb-sort recycling, as evaluated in Section 2 of this report. In addition, R. W. Beck estimated costs associated with the following processing options:

- Process at a City-owned Material Recovery Facility (MRF)
- Contract with a private MRF

R. W. Beck summarizes the costs associated with these options at the conclusion of this section and provides key findings and recommendations based on the results of the analysis.

4.2 Collection Options

R. W. Beck utilized its Proprietary Collection Model to project the collection costs associated with both dual-stream and single-stream collection. R. W. Beck compared the costs for these alternative collection options to the cost of the status quo system (e.g., curbside-sort). Below is a brief description of the two alternative options as well as the status quo system.

Table 4-1
Collection Options

Option	Container	Frequency	Vehicles
Status quo	18-gallon bin	1 time per week	Kann curb-sort truck
Dual-stream	18-gallon bin	1 time per week	Manual, split bodied truck
Single-stream	96-gallon rolling cart	1 time per week	Fully automated truck

1. Recovered material assumptions shown here are net of any contamination.

For this analysis, R. W. Beck evaluated both the collection costs and administrative costs associated with each collection option.

4.2.1 Overview of Model Assumptions

The R. W. Beck Proprietary Collection Model uses a variety of assumptions to project the costs associated with solid waste collection service. The majority of these assumptions are based on R. W. Beck's general industry knowledge and experience in completing solid waste collection work for numerous other local government clients within Arkansas and nationwide. The assumptions include financial, capital, labor, collection, and disposal related items including:

- Financing costs
- Collection vehicle costs
- Staffing costs
- Route number estimations
- Disposal costs

All of the assumptions used in the collection model are based on the most up-to-date information available. However, because the solid waste industry is operating within a dynamic environment, it is important to note that to the extent that assumptions change in the future, the costs associated with collection would also change. For instance, in the event that there is a change in the City's cost of disposal, the model assumptions would need to be adjusted. Key assumptions are discussed in the following sections.

Household Account Information

This model was constructed to give a cost overview of the different options at a specific point in time – FY 2008. This allows the City to compare actual costs of the status quo system to the projected cost of the different scenarios presented. According to data provided by the City, the total estimated number of household accounts in FY 2008 is 18,830. This number provided the base for this model's predictions. Because the report is presented as a snapshot, it does not attempt to incorporate growth projections for the City. However, the impact of population growth on the collection and processing system is discussed in subsequent portions of this section.

Recovered Material

R. W. Beck made assumptions regarding the quantity of material that would be recovered through a dual- or single-stream program based on industry experience working with recycling programs in the Southwest region of the United States.[1] For this analysis, R. W. Beck assumed that a dual-stream program would yield 600 pounds of material per household annually and that a single-stream program would yield 720 pounds per household annually.[2] These estimates are net of any contamination.

[1] Specifically, R. W. Beck has evaluated recycling programs in Arkansas, Texas, Louisiana, Oklahoma, and Arizona.

[2] These material estimates were made with the assumption that glass will be included in the program. Further discussion on glass can be found in Section 4.3.1.

R. W. Beck does not expect a significant increase in material yield with a transition to a dual-stream program. This is because, from the perspective of the resident, there is little difference between the status quo system and a dual-stream system. However, R. W. Beck assumed a small increase due to the assumed budget increase for public education.

R. W. Beck would expect a more substantial increase in material yield with a transition to a single-stream program. The novelty of carts, additional capacity for material, and increased public education will contribute to increased material generation from residents. R. W. Beck's material recovery assumptions are summarized in Table 4-2.

Table 4-2
Material Recovery Assumptions

Recovery	Status Quo	Dual-Stream	Single-Stream
Contamination rate [1]	<1%	3-7%	10-15%
Recovered material (lbs/household) [2]	587	600	720
Recovered material (total tons)	5,523	5,649	6,779

1. Contamination rate assumptions are based on R. W. Beck industry experience as well as information provided by private companies during interviews (see Section 3).
2. Recovered material assumptions shown here are net of any contamination.

Collection Efficiency

Table 4-3 shows the estimated number of routes needed for each of the recycling options. The number of required routes was determined using R. W. Beck's Proprietary Collection Model. The model includes the assumptions listed below.

- Number of trips per day to unload material – 1 trip
- Round trip travel time from the Transfer Station to the route – 20 minutes
- Pre-and-post-trip inspections (includes all pre-and-post-route duties) – 30 minutes
- Breaks – 30 minutes based on two 15 minute breaks
- Lunch – 30 minutes
- Hours worked per day – 10 hours

Table 4-3
Collection Efficiency Assumptions

Metrics	Status Quo	Dual-Stream	Single-Stream
Average route size	523	942	1,569
Collections/route [1]	293	565	784
Routes needed	9	5	3

1. Based on a 60% set out rate for dual-stream and a 50% set out rate for single-stream and a 56% set out rate for the status quo.

In the status quo system, recycling and refuse drivers have a scheduled work day of 10 hours. However, as discussed in Section 2, the drivers have an incentive program wherein they are paid on a task-based system. The drivers may leave for the day when all routes have been completed and are guaranteed pay for 40-hours of work. Because of this incentive program, the recycling drivers effectively work 8.5 to nine hours per day as opposed to the scheduled 10 hours.

In the current system, the incentive program has many benefits. First, the curb-sort drivers work in a very rigorous and physically demanding system, and it may not be feasible for them to work a 10-hour day. Also, the incentive program helps attract quality personnel in a system that can be challenging to staff. However, in typical dual- and single-stream recycling programs, even more so for single-stream, it is uncommon for drivers to work on a task-based system. Additionally, the City will achieve maximum collection efficiency if routes are designed for a 10-hour day. Therefore, for the purpose of this analysis, R. W. Beck has assumed that the recycling drivers will work 10 hours each day. In discussions with R. W. Beck, City staff confirmed that this is a reasonable assumption.

Staffing

Table 4-4 shows R. W. Beck's staffing cost assumptions for the dual- and single-stream options.

Table 4-4
Staffing Cost Assumptions (per employee) [1]

Position	Salary	Benefits	Total
Waste Reduction Coordinator	$48,680	$16,226	$64,906
Crew Leader	$40,972	$12,389	$53,361
Truck Driver	$30,383	$10,649	$41,032
Relief Driver	$34,693	$6,239	$40,932
Enforcement Officer [2]	$40,000	$12,000	$52,000

1. Based on 2008 actual salary data for the City's solid waste staff.
2. R. W. Beck assumed that an enforcement officer would be compensated similarly to a crew leader.

The table summarizes the cost per employee by type of position. Assumptions regarding the number of staff per position are listed below.

- Waste Reduction Coordinator: This position was allocated to dual- and single-stream in the same manner as it was allocated to the status quo system, as explained in Section 2.4.
- Crew Leaders: One Crew Leader would be needed for either a dual- or single-stream program.[3]
- Truck Drivers: One driver per route for both dual- and single-stream

[3] It may be possible to combine the refuse and recycling routes under one Crew Leader. However, in order to keep this analysis conservative, R. W. Beck assumed that the recycling system would have its own Crew Leader.

- Relief Drivers: The three relief drivers were allocated to dual- and single-stream in the same manner as they were allocated to the status quo system, as explained in Section 2.4.
- Enforcement Officer: R. W. Beck assumed that no enforcement personnel would be needed for dual-stream because drivers can reject contaminated material at the curb. However, for single-stream, one full time enforcement officer was included.

Vehicles

Either the dual-stream or single-stream options would require the City to purchase new recycling vehicles. There is a possibility that the current fleet could be retrofitted to accommodate dual- or single-stream, but this would be an interim solution until new vehicles could be purchased. R. W. Beck included capital costs for new vehicles in the cost estimates for dual- and single-stream.

As noted in Table 4-1, R. W. Beck assumed that the City would utilize fully-automated collection vehicles for a single-stream program. The City currently uses this type of vehicle for residential refuse collection, as shown in Figure 4-1. R. W. Beck assumed that the City would use manual, split-bodied vehicles for a dual-stream program. Figure 4-1 also shows an example of this type of vehicle.

Figure 4-1: Examples of Automated and Manual, Split-Bodied Recycling Vehicles

Table 4-5 shows the capital cost estimates for the dual- and single-stream vehicles.

Table 4-5
Vehicle Capital Costs (per unit)

Vehicle	Manual Truck	Automated Truck
Purchase Price	$190,000	$215,000
Useful Life	7	7
Cost of Capital	5.0%	5.0%
Amortized Annual Cost	$32,836	$37,156

R. W. Beck estimated the cost for vehicle maintenance based on industry experience as well as the actual costs for the City to maintain its existing refuse and recycling fleets. R. W. Beck assumed annual maintenance costs of $15,000 per vehicle for front-line manual vehicles. R. W. Beck assumed annual maintenance costs of $22,500 for front-line automated vehicles.

The City would also need to have backup vehicles for either a dual- or single-stream program. R. W. Beck typically recommends a backup vehicle ratio of 25 percent. In this case, R. W. Beck assumed one backup vehicle for both dual- and single-stream. R. W. Beck assumed that the backup vehicle purchase price would be 50 percent of the new vehicle purchase price.

R. W. Beck also developed assumptions for the cost of fuel per recycling route. R. W. Beck utilized actual fuel cost data provided by the City in developing these assumptions. R. W. Beck assumed fuel costs of $12,000 per route for dual-stream and $15,000 per route for single-stream. The single-stream fuel cost per route was based on the actual fuel cost per route for the City's automated refuse routes. The cost for fuel for dual-stream routes is expected to be less than single-stream because dual-stream trucks have fewer moving parts than automated trucks.

The City will also incur some stranded costs associated with the existing recycling fleet. R. W. Beck provides discussion on this issue in subsequent portions of this section.

Containers

For a dual-stream program, R. W. Beck assumed that the City would continue to utilize the current 18-gallon, open-top bins from the status quo program. However, each resident would also receive an additional bin in order to set out fibers and containers in separate bins. The City's current recycling bins cost approximately $9.00 each, including the lid. The purchase of the additional bins would be amortized over a 5-year period for an annual amortized cost of $39,143. R. W. Beck also assumed that approximately 20 percent of the bins would be replaced each year. Based on this assumption, the annual bin replacement cost for dual-stream would be $67,788.[4]

For a single-stream program, R. W. Beck assumed that the City would provide each household with a rolling cart with capacity up to 96 gallons, which is approximately the same size as the largest residential refuse cart offered by the City. R. W. Beck assumed a per-cart cost of $55, which includes a 10-year warranty and the cost of delivery to the customer. The purchase of these carts would be amortized over a 10-year period for an annual amortized cost of $134,121. Due to the 10-year warranty that is included in the purchase price, R. W. Beck did not include any costs for cart replacement.

[4] 37,660 total bins * 20% * $9.00 per bin = $67,788

Administrative Costs

In the analysis of collection costs, R. W. Beck included administrative costs in order to provide a full understanding of the costs associated with dual-stream and single-stream programs. R. W. Beck assumed that administrative costs for dual- and single-stream will remain the same as the status quo system, as shown in Section 2.4. However, R. W. Beck assumed an increased budget for public education to raise awareness about program changes. R. W. Beck's public education assumptions are below.

- Dual-stream: $2.00 per household annually, or $37,660
- Single-stream: $3.50 per household annually, or $65,905

4.2.2 Collection and Administrative Cost Summary

Table 4-6 summarizes the collection and administrative costs associated with the three recycling scenarios. In summarizing costs, R. W. Beck allocated costs into the following categories in order to remain consistent with how the City allocates costs internally.

- **Personnel costs:** Includes salary and benefits costs for all personnel.
- **Materials and supplies:** Primary components are fuel, container replacement, and public education. Also includes office supplies and printing, cleaning supplies, chemicals, minor equipment, and collection supplies.
- **Services and charges:** Includes primarily cost allocation and insurance.
- **Vehicle costs:** Includes maintenance, repair, and capital costs for vehicles.[5]
- **Containers:** Includes capital costs associated with the purchase of additional bins for dual-stream recycling and rolling carts for single-stream recycling.

[5] Please note that this analysis does not account for stranded vehicle costs associated with the existing recycling fleet.

Table 4-6 summarizes collection and administrative costs for the three scenarios.

Table 4-6
Collection and Administrative Costs

Account	Status Quo [1]	Dual-Stream	Single-Stream
Personnel Costs	$478,432	$314,633	$284,569
Materials and Supplies	$138,686	$180,140	$125,597
Services and charges	$61,034	$61,034	$61,034
Vehicle costs	$385,736	$271,913	$217,614
Containers [2]	$0	$39,143	$134,121
Annual Cost [3]	$1,063,889	$866,865	$822,936
Monthly/household	$4.71	$3.84	$3.64

1. Costs for the status quo system are taken from the cost of service analysis in Section 2.
2. Container costs include capital costs for the purchase of 18-gallon bins for dual-stream and 96-gallon carts for single-stream.
3. Annual costs do not include material processing costs or revenue generated from material sale.

As shown in the above tables, the dual- and single-stream options both provide collection and administrative cost savings over the status quo. However, processing costs must be taken into account in order to provide a thorough analysis of the two potential options. Processing costs are discussed in the following section.

4.3 Processing Options

R. W. Beck also analyzed the costs associated with processing options for the City of Fayetteville. R. W. Beck projected processing costs for a City-owned and operated MRF as well as hauling to a private MRF. For each of these options, R. W. Beck provided an understanding of the costs for dual-stream and single-stream.

To develop cost estimates for the City to construct and operate a MRF, R. W. Beck utilized its proprietary MRF model. To develop cost estimates for hauling to a private MRF, R. W. Beck formulated assumptions based on the interviews with private companies summarized in Section 3. R. W. Beck compared the costs for these processing options to the cost of the status quo system (e.g., City-owned and operated baling facility).

4.3.1 Processing Assumptions

Materials Included

R. W. Beck developed assumptions regarding the materials that would be included in a dual- or single-stream program. With input from the City, R. W. Beck assumed that the following commodities would be included in a dual- or single-stream program.

- Aluminum cans

- Plastic bottles #1 (PET)
- Plastic bottles #2 (HDPE colored and natural)
- Plastic containers #3-#7
- Steel cans
- Glass beverage containers (green, clear, and brown)
- Newspaper
- OCC and chipboard

The material mix shown above is very similar to the material mix currently accepted in the status quo system. The primary difference is the ability to accept expanded varieties of plastic (such as #3-#7) as well as the ability to recover and market colored and natural HDPE as separate commodities. In the status quo system, colored and natural HDPE are collected together and sold as a single commodity.

R. W. Beck conducted this analysis with the assumption that glass would continue to be included as part of the City's program. Glass is a material that has historically not been included in some single-stream programs. When included in a commingled stream, glass bottles can break and contaminate fiber material, resulting in a lower quality product to be sold at market. Some single-stream MRFs have been reluctant in the past to accept glass due to the increased wear-and-tear on the processing equipment as well as personnel safety issues. However, as discussed in Section 3, the processors interviewed by R. W. Beck indicated that, although they generally prefer not to accept glass, they are willing to work with cities to accommodate the needs of a particular program. Processors recognize the challenges associated with eliminating a material that has historically been included in a municipal program. Because of the results of the interviews, R. W. Beck assumed that glass would be included in the City's program. The financial assumptions of this analysis also take into consideration that glass will be included in the program.

Quantity of Material

In Section 4.2.1 above, R. W. Beck described material recovery assumptions for dual- and single-stream recycling. R. W. Beck assumed that a dual-stream program would yield 600 pounds of material per household annually and that a single-stream program would yield 720 pounds of material per household annually. These assumptions result in annual residential recycling of 5,649 tons for dual-stream and 6,779 for single-stream. These estimates assume the inclusion of glass in a program and are net of any contamination.

Value of Material

In order to determine the amount of revenue that would be generated from a dual- or single-stream program, R. W. Beck developed assumptions for the value of recovered material. R. W. Beck developed these assumptions based on the analysis summarized in Section 1.4.4. Based on discussions with private processors, it is common for cities to receive a premium price for fiber that is collected in a dual-stream program because

the fiber is not contaminated with glass or other materials. As such, R. W. Beck assumed a 10 percent premium for fiber material (e.g., newspaper, OCC, chipboard) collected in dual-stream. Table 4-8 shows the projected weighted average value of material for single-stream and dual-stream programs.

As shown in the table, R. W. Beck assumed that glass has no resale value in a dual- or single-stream system. This is based on the interviews with processors described in Section 3 of this report.

Table 4-7
Projected Commodity Mix and Material Value

Material	Status Quo		Alternative Options			
	Actual Composition [1]	Avg. Selling Price [2]	Projected Composition [3]	Single-Stream Price [4]	Dual-Stream Price [5]	Market Index
Aluminum	1.3%	$1,727	1.0%	$1,509	$1,509	Waste News [6]
PET (#1)	3.1%	$348	3.0%	$217	$217	Waste News
HDPE Colored (#2)	2.2%	$531	1.0%	$410	$410	Waste News
HDPE Natural (#2)	N/A	N/A	1.0%	$350	$350	Waste News
Plastic #3-#7 [7]	N/A	N/A	1.0%	$100	$100	Processor interviews
Steel Cans	2.7%	$147	3.0%	$169	$169	Waste News
Green Glass	4.5%	$25	5.0%	$0	$0	Processor interviews
Clear Glass	6.5%	$50	7.0%	$0	$0	Processor interviews
Brown Glass	8.5%	$35	9.0%	$0	$0	Processor interviews
#6 News	16.8%	$57	17.0%	$34	$37	OBM [8]
OCC/Chipboard	17.7%	$129	17.0%	$60	$66	OBM
#8 News	36.7%	$87	35.0%	$86	$95	OBM
Weighted Average	100%	$118	100%	$81	$86	N/A

1. Average actual composition for 2005-2007.
2. Average actual per ton selling price for FY 2007.
3. The projected material composition is based on the average actual material composition for the past three years (see Table 2-3).
4. Single-stream material pricing is based on the commodity price analysis shown in Section 1.4.4.
5. Dual-stream material pricing is based on the commodity price analysis shown in Section 1.4.4. with a 10% premium for fiber.
6. Source: Waste News Secondary Materials Pricing, Southcentral Region (Houston, TX).
7. Based on discussions with processors, Plastics #3-#7 make up a very small part of the composition of a commingled stream.
8. Source: Official Board Markets Yellowsheet, Southwest Region.

4.3.2 Processing at a Private MRF

R. W. Beck projected the processing costs and revenues associated with processing material at a private MRF. This analysis assumes that the processing facility used by the City would be within Northwest Arkansas and does not account for hauling outside of Northwest Arkansas.

R. W. Beck formed assumptions regarding the financial terms of a private processing agreement in interviews with private processing companies. Based on these discussions, R. W. Beck assumed that the financial agreement with a processing company would be consistent with the formula shown in Figure 4-2.[6]

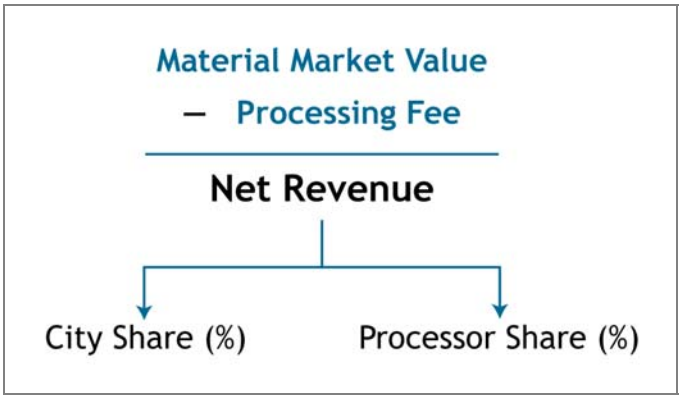

Figure 4-2: Probable Formula for Processing Contract Financial Terms

Listed below are R. W. Beck's assumptions regarding the processing fees and revenue sharing agreement with a private processor.

Material Market Value

The material market value refers to the revenue that the processor receives from selling material. For this analysis, R. W. Beck assumed that dual-stream material is worth $86 per ton and that single-stream material is worth $81 per ton, as shown in Table 4-7

Processing Fees

As described in Section 3, several of the processors interviewed were able to give planning-level estimates of the processing fees that would be charged to the City. These companies estimated that the processing fees paid by the City would be between $30 and $40 per ton. Based on R. W. Beck's experience, these estimates are consistent with processing fees in place in other communities in the Southwest region of the United States. Therefore, for the purposes of this analysis, R. W. Beck assumed

[6] In weak markets, the value of recyclables will fall below the cost for processing. However, in developing a contract with a private company, the City would be able to mitigate adverse financial impact on the City if the market value of materials falls below the cost of the processing fee.

that the City would pay a processing fee of $35 per ton for dual- or single-stream recyclable material.

Revenue Sharing

When processing fees are subtracted from the market value of material, there is typically some net revenue that remains. Revenue sharing, also known as a rebate, determines how much net revenue will be paid to the City and how much the processor will keep. Based on discussions with private processors, R. W. Beck assumed that the City would keep 50 percent of the net revenue from dual- or single-stream recyclable material.

Summary of Processing Costs and Revenues

Table 4-8 summarizes the projected processing costs and revenues if the City were to enter into a service agreement with a private company for processing of recyclables. As shown in the table, the City would net $25 in revenue per ton for dual-stream material and $23 in revenue per ton of single-stream material.

Table 4-8
Processing Cost Comparison of Status Quo System to a Private MRF

Processing Costs	Status Quo	Dual-Stream	Single-Stream
Material Market Value	$524,685	$485,577	$551,455
Processing Costs	($265,867)	($197,715)	($237,258)
Net Revenue	$258,818	$287,862	$314,197
City Revenue Share (%)	100%	50%	50%
City Revenue Share ($)	$258,818	$143,931	$157,099
Total tons	$47	$25	$23
Per ton	$524,685	$485,577	$551,455

4.3.3 Processing at a City-Owned MRF

Overview

R. W. Beck also provided the City with an indication of the costs associated with owning and operating a MRF within the City to sort and bale recyclable materials. The cost estimates provided in this section are planning level estimates. They provide the City with an appreciation of the types and magnitude of costs associated with owning and operating a MRF.

Additionally, the general trend for MRFs across the United States is single-stream. However, at the end of this section, R. W. Beck provides an understanding of the cost differentials typically associated with dual-stream versus single-stream MRFs.

Capital Costs

According to the *Materials Recycling and Processing in the United States Yearbook and Directory, 2007-2008* (MRF Directory), the average cost to construct a MRF is $101,000 per ton of daily processing capacity (in 2006 dollars). This is based on an average of over 236 facilities across the United States. Adjusting that number to 2008 dollars, using an annual inflation rate of 2.5 percent, results in a capital cost of approximately $106,100 per ton of daily processing capacity.

R. W. Beck's projected residential tonnage for dual- and single-stream is discussed above. However, if the City were to develop a MRF, the facility would process the recyclable material generated by all of the City's programs. In Section 1, R. W. Beck provided projections of the total recycling tonnage in the City for the next five, 10, and 20 years.[7] R.W. Beck utilized these projections to determine the appropriate daily capacity for a single-stream facility. Table 4-9 shows the projected daily capacity needs for a single-stream MRF based on R. W. Beck tonnage projections discussed in Section 1.

Table 4-9
Projected Tons Processed – Single-Stream MRF

Year	Annual Tons	Daily Tons	Required Capital Cost
2008	10,210	39.3	$4,169,730
2009	11,265	43.3	$4,594,130
2010	11,710	45.0	$4,774,500
2011	11,989	46.1	$4,891,210
2012	12,269	47.2	$5,007,920
2013	12,548	48.3	$5,124,630
2018	13,946	53.6	$5,686,960
2028	16,976	65.3	$6,928,330

Based on the information in Table 4-9, R. W. Beck would expect a facility to cost up to approximately $6.8 million in order to be able to handle the projected daily capacity for the next 20 years. R. W. Beck assumed that the capital costs for the City's single-stream MRF would be approximately $6.0 million, resulting in a daily processing capacity of 57 tons. Assuming a 15 year useful life and 5.0 percent interest rate, the annual payment would be $578,054 for a single-stream MRF.

The capital costs discussed in Table 4-9 include the building, site improvements, and processing equipment. For a single-stream system, the City would likely employ a system with some degree of automation that would include:

- Initial screen to separate fiber materials from containers
- Magnetic separator to pull steel cans from the material stream

[7] This projection assumes that there is no expansion of the commercial recycling program.

- Eddy-current separator to pull aluminum cans from the material stream

In larger systems, some of the manual sorting on the pick lines would be replaced by optical sorting systems. However, this type of system is typically implemented for larger incoming material quantities and is not assumed for this analysis

Rolling Stock

The City has a skid steer that it currently uses as part of the current MRF operation. However, the daily material handling requirements of a single-stream MRF may exceed what the skid steer is designed to accommodate. Therefore, R. W. Beck assumed for this analysis that the City would purchase one new wheel loader. The City would also be able to utilize its existing forklift for hauling bales within the MRF. Table 4-10 summarizes the rolling stock capital costs.

Table 4-10
Rolling Stock Cost for Single-Stream MRF

Description	Annual Cost [1]
Forklift	$6,602
Skid steer	$4,780
Wheel loader [2]	$14,690
Total	$26,072

1. Actual replacement cost for forklift and skid steer.
2. Assumes a 7 year useful life and 5.0 percent interest rate on an $85,000 wheel loader.

Labor

R. W. Beck prepared an estimate of the annual personnel costs associated with operating a single-stream MRF based on what is typical to single-stream MRFs of similar size. Table 4-11 summarizes personnel costs for the single-stream MRF.

Table 4-11
Personnel Costs for Single-Stream MRF

Position	Qty	Annual Salary (ea)	Annual Benefits (ea)	Total Salary and Benefits
Supervisor [1]	1	$40,972	$12,389	$53,361
Equipment operator [2]	2	$30,383	$10,649	$82,064
Pick line laborers [3]	15	$25,000	$8,333	$500,000
Site laborers [3]	2	$25,000	$8,333	$66,667
Total	20	---	---	$702,092

1. Based on the average salary for a Solid Waste Crew Leader
2. Based on the average salary of the MRF Operators in the City's current baling facility.
3. Based on R. W. Beck industry experience; benefits are assumed to be 1/3 of salary costs.

Hauling to End Markets

The City will incur costs for hauling baled material to end users. R. W. Beck assumed that the City would haul 20 tons of baled material per load to end users at a cost of approximately $0.08 per ton-mile. Assuming an average hauling distance of 245 miles,[8] the cost per load of baled material would be approximately $391.[9]

Other Operating and Maintenance Expenses

Table 4-12 provides representative operating and maintenance (O&M) costs for a single-stream MRF. These are planning level costs that provide the City with a high-level understanding of the costs involved with operating a MRF facility.

Table 4-12
Representative Non-Labor O&M Costs

Cost Item	Estimated Annual Cost
Equipment maintenance & repair	$100,000
On-site fuel usage	$10,000
Utilities	$20,000
Miscellaneous supplies & maintenance	$15,000
Total	$145,000

For this analysis, R. W. Beck assumed a residual rate of 15 percent for the MRF and that residual hauling costs would be negligible. Table 4-13 summarizes the disposal cost for single-stream MRF residuals.

Table 4-13
Residual Hauling and Disposal Costs

Description	Residual Disposal
Residual Amount (tons) [1]	1,392
Disposal Fee [2]	$24.47
Total Residual Disposal Cost	$34,062

1. Based on 15% residual rate for single-stream recycling. See Table 1-6 for more detail on this analysis.
2. Current disposal cost at the City's transfer station.

[8] R. W. Beck calculated the average one-way distance between Fayetteville and the following cities: Tulsa, Dallas, Little Rock, St. Louis, Kansas City, and Oklahoma City.

[9] In interviews, some processors mentioned that end users and mills often pay freight costs for transportation of bales. However, for the purposes of making the analysis conservative, R. W. Beck included hauling cost for bales.

Dual-Stream MRF

If the City were to move forward with collecting and processing materials in a dual-stream rather than a single-stream, the cost for constructing a new MRF would be less than the single-stream MRF discussed in this section. On average, single-stream MRF capital costs are 10 percent to 20 percent more than dual-stream facilities of similar size. For this analysis, R. W. Beck assumed that dual-stream MRF capital costs were 15 percent lower than single-stream capital costs resulting in an annual payment of $491,346.

R. W. Beck would expect that operating costs for a single-stream and dual-stream MRF would be relatively similar. Therefore, R. W. Beck assumed that most of the operating costs for a dual-stream MRF would be the same as a single-stream MRF. However, the following costs would be different under a dual-stream scenario:

- Residual disposal is less for dual-stream. R. W. Beck assumed a 10 percent residual rate for dual-stream, resulting in residual disposal costs of $18,377.[10]
- Hauling cost for bales is also less for the due to less material being processed.

Summary of Processing Costs and Revenues

Table 4-14 summarizes the costs of processing for a City-owned and operated MRF.

Table 4-14
Total MRF Processing Costs

Description	Dual-Stream	Single-Stream
Capital		
Facility & equipment	$491,346	$578,054
Rolling stock	$26,072	$26,072
Subtotal	$517,417	$604,125
Labor	$702,092	$702,092
Non-Labor Operating Costs		
Equipment maintenance & repair	$100,000	$100,000
On-site fuel usage	$10,000	$10,000
Utilities	$20,000	$20,000
Misc. supplies & maintenance	$15,000	$15,000
Hauling of bales	$150,377	$172,480
Residual disposal	$18,377	$34,062
Subtotal	$313,754	$351,542
Total Cost	$1,533,263	$1,657,759
Total tons processed	8,439	10,210
Cost per ton processed	$182	$162

[10] See Table 1-6 fore more detail on the tonnage and residual projections for the MRF.

Table 4-15 summarizes the processing costs and revenues for a City-owned MRF. As shown in the table, the City would have a net cost of $96 per ton of dual-stream material and $81 per ton of single-stream material.

Table 4-15
City-Owned MRF Processing Costs and Revenues

Processing Costs	Status Quo	Dual-Stream	Single-Stream
Material Market Value	$524,685	$485,577	$551,455
Processing Costs	($265,867)	($1,028,118)	($1,098,166)
Net Revenue (Cost)	$258,818	($542,541)	($546,710)
City Revenue Share (%)	100%	100%	100%
City Revenue Share ($)	$258,818	($542,541)	($546,710)
Total tons	$47	($96)	($81)
Per ton	$524,685	$485,577	$551,455

4.3.4 Additional Processing Options

This processing options analysis assumes that the City utilizes a public or private MRF within Northwest Arkansas. However, based on R. W. Beck's discussions with private processors, the City may also be able to utilize processing facilities that are outside of Northwest Arkansas. This can be done by long-hauling material to a facility using one of the following methods:

- **Roll-off containers:** The City could transport recyclables in roll-off containers. Compacting material in the roll-offs containers will maximize the amount of material per load.
- **Transfer trailers:** Material can be placed in transfer trailers to be transported to an existing MRF. R. W. Beck would expect that the City would be able to utilize the existing refuse transfer station infrastructure for the transfer of recyclables.
- **Baled material:** Due in part to very high commodity values, MRF operators have begun to accept baled, commingled materials from local governments outside of direct-hauling distance. Baled material could be loaded onto a semi-trailer to be hauled to the processing facility.

Based on the financial results of this analysis, long-hauling material to an existing MRF outside of Northwest Arkansas does not appear to be financially feasible given the assumptions of the current analysis. However, based on discussions with private processors, if a given facility had excess capacity in its system, that particular facility may be willing to pay a premium to the City for material. For this reason, R. W. Beck recommends that the City remain open to long-hauling material in order to evaluate specific opportunities that may arise.

4.4 Options Summary

Below is a financial summary of all of the options evaluated by R. W. Beck.

4.4.1 City-Owned MRF

Table 4-16 shows the costs for dual- and single-stream recycling assuming a City-owned MRF.

Table 4-16
City-Owned MRF Options Summary

Costs	Status Quo	Dual-Stream	Single-Stream
Collection costs	$1,063,889	$866,865	$822,936
Processing costs (revenues)	($258,818)	$542,541	$546,710
Total Cost	$805,071	$1,409,406	$1,369,646
Monthly/household	$3.56	$6.24	$6.06
Cost Savings	n/a	($604,335)	($564,575)
Monthly/household	n/a	($2.67)	($2.50)
Percent	n/a	-75%	-70%

4.4.2 Private MRF Recycling

Table 4-17 summarizes the costs associated dual- and single-stream recycling assuming that the City contracts with a private MRF for processing service.

Table 4-17
Private MRF Options Summary

Costs	Status Quo	Dual-Stream	Single-Stream
Collection costs	$1,063,889	$866,865	$822,936
Processing costs (revenues)	($258,818)	($143,931)	($157,099)
Total Cost	$805,071	$722,934	$665,837
Monthly/household	$3.56	$3.20	$2.95
Cost Savings	n/a	$82,137	$139,234
Monthly/household	n/a	$0.36	$0.62
Percent	n/a	10%	17%

4.4.3 Impact of Population Growth

In Section 1, R. W. Beck provided projections for City population growth over the next five, 10, and 20 years. The analysis provided in this section is intended to provide a snapshot of the costs of different scenarios to guide the City's decision making. However, the list below provides a brief discussion of the impact of population growth on the options discussed in this analysis.

- **Dual- and single-stream collection:** Larger collection operations are generally more efficient than small collection operations. As the City grows, they should be able to realize greater efficiencies and economies of scale.
- **Processing at a private MRF:** R. W. Beck would expect that, as the City grows and generates more recyclable material, they will be able to negotiate more favorable financial terms with private processors.
- **Processing at a City-owned MRF:** Greater quantities of recyclable material will reduce the processing cost per ton at the City-owned MRF. Thus, as the City grows and generates more recyclables, a City-owned MRF becomes a more feasible option.

4.4.4 Impact of Stranded Costs

The analysis in this section does not take into account the sunk costs, or stranded costs, of the current curb-sort fleet. However, R. W. Beck recognizes that these are costs that will have to be considered when transitioning to a new program. The annual depreciation costs for the recycling vehicles are summarized in Table 4-18.

Table 4-18
Vehicle Depreciation Costs

Vehicle	Purchase Price	Year Purchased	Useful Life (years)	Annual Cost
Sac truck (455)	$97,399	2000	8	$12,175
Sac truck (456)	$97,399	2000	8	$12,175
Sac truck (457)	$97,399	2000	8	$12,175
Sac truck (471)	$144,227	2003	8	$18,028
Sac truck (472)	$144,227	2003	8	$18,028
Sac truck (473)	$144,227	2003	8	$18,028
Kann truck (487)	$148,250	2007	8	$18,531
Kann truck (488)	$148,250	2007	8	$18,531
Kann truck (489)	$148,250	2007	8	$18,531
Kann truck (490)	$148,250	2007	8	$18,531
Kann truck (491)	$147,900	2007	8	$18,488
Kann truck (492)	$147,900	2007	8	$18,488

R. W. Beck recommends that the City try and sell the recycling vehicles in order to offset costs associated with transitioning to a new system. However, due to the unique style of the vehicles and the scarcity of curb-sort programs, the City may encounter some challenges with selling the vehicles. Therefore, the costs in Table 4-18 represent the worst-case scenario for the City of costs that would be incurred going forward if the vehicles were not sold. The City would incur stranded costs of $185,656 total from 2008 to 2010 and $131,571 from 2011 to 2014.

In addition, the City may not need to utilize the baler or related equipment (e.g., wire tie strapping system, conveyor) if they transition to a different recycling system. However, it is unlikely that the baler will become a stranded cost for the City. The City will have a variety of options for the baler, including:

- Selling the baler to a third party.
- Continuing to utilize the baler in the recycling system. There are some scenarios in which the City could continue to utilize the baler, such as if the City were to long-haul commingled bales of material to a MRF outside the region.
- Including purchase of the baler as part of the procurement for processing.

4.5 Key Findings and Recommendations

4.5.1 Collection Cost Savings Can Be Realized

The City can achieve cost savings by transitioning its collection system from the status quo system to dual-stream or single-stream. Below are R. W. Beck's specific findings regarding collection cost savings.

1. **Both dual-stream and single-stream collection systems would provide collection cost savings over the status quo system.** Annual savings in the dual-stream scenario would be $197,024 over the status quo, and annual savings in the single-stream scenario would be $240,953 over the status quo.
2. **The City can achieve greater cost savings with single-stream than with dual-stream.** The monthly collection cost per household for single-stream is $3.64, which represents $1.07 savings over the status quo. The monthly collection cost per household for dual-stream is $3.84, a savings of $0.87 over the status quo.

4.5.2 Single-Stream Provides Benefits over Dual-Stream

Both single-stream and dual-stream are financially feasible for the City and provide cost savings over the status quo system. **R. W. Beck recommends that the City move toward a single-stream program as opposed to dual-stream.** Single-stream provides greater cost savings for the City. In addition, single-stream can provide many non-financial benefits to the City, such as:

- Single-stream recycling with rolling carts provides greater potential to maximize material recovery and the recycling rate in the City.
- Single-stream provides greater opportunity and flexibility to service multi-family and commercial customers (these options are further discussed in subsequent sections of this report.)
- Automated recycling vehicles provide greater operational efficiency as well as increased safety for recycling drivers.
- The general trend for recycling programs in the nation is toward single-stream. Therefore, if the City transitions to dual-stream, there is a risk that there will be a need to make further program changes in the near future.
- All of the processors interviewed by R. W. Beck either have an operational single-stream MRF or plan to convert their existing facility to single-stream in the next 12 months.

4.5.3 Contracting with a Private MRF is the Preferred Processing Option

Because of the City's relatively low recycling volumes, it is not financially feasible for the City to construct and operate its own dual- or single-stream MRF. On the other hand, contracting with a private MRF could provide financial benefit to the City. Below are R. W. Beck's key findings and recommendations regarding these two potential processing options.

1. **If utilizing a City-owned MRF, the City would incur a net cost of $96 per ton for dual-stream material and $81 per ton for single-stream material.** When combined with collection costs, as shown in Table 4-16, the total system costs are significantly higher than the status quo system costs.
2. **If utilizing a private MRF, the City would receive net revenue of $25 per ton for dual-stream and $23 per ton for single-stream.** This net revenue level is lower than the status quo net revenue of $47 per ton. However, when combined with collection costs, as shown in Table 4-17, the total system costs for single stream provide cost savings over the status quo.

4.5.4 Changing the System Will Require a Policy Decision

As shown in the above analysis, the City has the potential to reduce the costs of the recycling system and increase material recovery by transitioning to single-stream. However, in R. W. Beck's opinion, the potential financial benefits are not pronounced enough to make the decision to change the program based on cost savings alone. This is primarily because the City has been extremely effective in operating its current program in an efficient manner and recovering high quantities of material. **Although there are financial considerations associated with changing the recycling**

program, it is R. W. Beck's opinion that the decision whether to transition to a new recycling program will be primarily a policy decision.

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Section 5
Commercial and Organics Recycling

5.1 Overview

The City of Fayetteville has an interest in increasing commercial recycling. This section contains R. W. Beck's analysis of how the City can provide commercial recycling service through the follow types of programs:

- Fiber-only recycling
- Single-stream recycling

R. W. Beck also provided an evaluation of whether and how the City can provide commercial organics (e.g., food waste) collection and composting. In this analysis, R. W. Beck assumed that all collected food waste material would be integrated into the City's current yard waste composting operation.

This section includes a planning-level analysis of how cost of service rates for commercial and organics recycling, as well as commercial refuse, could be structured to maximize the incentive for customers to recycle.

5.2 Commercial Recycling Program

Throughout this report, R. W. Beck has evaluated the City's recycling systems based on three different options, listed below.

- Source-separated (status quo)
- Dual-stream
- Single-stream

R. W. Beck would expect that, if the City had either a source-separated or dual-stream system, the commercial recycling program would focus on the recovery of fibers (e.g., OCC and office paper). The primary challenges with providing dual-stream recycling to businesses is that many businesses do not have space for two separate dumpsters for containers and fibers. Because of this, R. W. Beck provided analysis of how fiber-based recycling service can be provided to the City's commercial customers. However, in the event that the City converted its residential recycling system to single-stream, the City would be able to provide single-stream recycling to businesses. Therefore, R. W. Beck also provided some discussion of how the City could provide single-stream recycling service to commercial customers.

5.2.1 Fiber-Only Commercial Recycling Program

As of October 2008, the City operates a dedicated front-load route for commercial OCC collection.[1] Prior to October, this route was shared between commercial recycling and commercial refuse. The City has had success in being able to gain participation from an increasing number of customers in this program, and as such, they have made the decision to designate a full route to providing this service.

The following analysis describes how the City can maximize this existing commercial recycling route by doing the following:

- Adding customers to the recycling route until it reaches full capacity; and
- Expanding the program to include collection of office paper.

Table 5-1 summarizes the material that was diverted through the commercial OCC program over the last three years, and the resulting commercial recycling rate.

Table 5-1
Diversion from Current Commercial Recycling Program (in tons)

Commercial Waste Generation	2005	2006	2007
Recycling (OCC)	742	1,093	928
Disposal	29,190	31,364	30,066
Waste Generated	29,932	32,457	30,994
Recycling Rate [1]	*2.5%*	*3.4%*	*3.0%*

1. Includes only material that is managed by the City's Solid Waste Management Department and does not include material that is generated in the City but managed by a private company.

Market Size

There is no waste characterization data available for the City's commercial waste stream. However, information from various waste characterization studies from other communities and regions can aide in approximating the amount of recyclable material in the City's commercial waste stream. Based on data collected in other commercial waste characterization studies, office paper can represent between five and 15 percent of the commercial waste stream. OCC can represent between eight and 15 percent of the commercial waste stream.[2] Based on these estimates, there is between 3,909 tons and 9,020 tons of material in the commercial waste stream that can potentially be recovered through the City's fiber recycling program. Table 5-2 below summarizes this analysis.

[1] In-house recycling from City-owned facilities is also collected as part of this route.
[2] Sources: Georgia Statewide Waste Characterization (2005), Missouri Municipal Solid Waste Composition Study (2006-2007), City of Denton Waste Characterization Study (2001), Wisconsin Statewide Waste Characterization Study (2003), State of Ohio Waste Characterization Study (2002)

Table 5-2
Estimated Commercial Fiber Market Size

	Composition (%)		Weight (tons)	
Material	Low	High	Low	High
Office Paper	5%	15%	1,503	4,510
OCC	8%	15%	2,405	4,510
Total	13%	30%	3,909	9,020
Current Diversion	3%	3%	928	928
Potential Diversion	10%	27%	2,981	8,092

Staffing and Equipment

As previously mentioned, the City has a dedicated front-load route for OCC collection. Table 5-3 summarizes the current stops, containers served, and cubic yards served per day of the week for the commercial OCC route.

Table 5-3
Capacity of Current Commercial Recycling Route

Route Capacity	Mon	Tues	Wed	Thurs	Fri
Stops	12	81	12	56	12
Containers serviced	16	85	16	58	16
Cubic yards serviced	76	482	76	332	76

As shown in the table, the City's current recycling route collects between 12 and 81 stops per day. Based on industry experience, R. W. Beck would expect that a commercial refuse route would be able to collect 85 stops per day, representing up to 120 containers and 725 cubic yards of waste. However, commercial recycling routes are generally less productive than refuse routes due to lower route density. Commercial recycling trucks must typically drive farther distances on average to service containers than do commercial refuse trucks. Therefore, R. W. Beck would expect commercial recycling routes to collect between 70 and 80 stops per collection day. For the purposes of this analysis, R. W. Beck assumed a maximum route capacity of 80 stops. On commercial recycling routes, customers are less likely to have multiple containers at one location. Therefore, R. W. Beck would expect the City to collect five percent more containers than stops, based on what is currently being done on the Tuesday and Thursday routes, for an average of 84 containers. Based on these targets, the Tuesday route is operating at full capacity, and the Thursday route is approaching full capacity. There is significant excess capacity, and therefore potential to add new customers, on Monday, Wednesday, and Friday.

Because there is excess capacity in its designated commercial recycling route, the City has the opportunity to increase commercial recycling without adding additional staff or equipment. R. W. Beck recommends that the City make a concerted effort to

maximize the existing route by targeting 80 stops for each collection day. This recommendation is discussed in more detail at the conclusion of this section.

Table 5-4 summarizes production data for the current recycling route as well as a full-capacity recycling route. As shown in the table, the route at current capacity should generate the current level of tonnage, or 928 tons annually. However, if the route were expanded to full capacity, it has the potential to generate 2,293 tons annually.

Table 5-4
Productivity in Current and Full-Capacity Route

Productivity (weekly)	Current	Full-Capacity
Stops	173	400
Containers serviced	191	420
Cubic yards serviced	1,042	2,520
Tons collected (annual)	928	2,293

Processing

In the status quo system, processing of materials collected in the fiber-only commercial recycling program would be done at the City's MRF. Based on analysis summarized in Section 2.4, it costs approximately $41 per ton to process material at the City's MRF. Revenue from the sale of recovered material would offset processing costs incurred by the program.

The City only accepts OCC in its current commercial recycling program. However, R. W. Beck believes that it potentially would be feasible to collect both OCC and office paper as part of this program. The City could explore options for processing commingled OCC and office paper using existing staff and equipment. For instance, after the trucks unloaded the material on the tipping floor of the MRF, the MRF operators could manually sort the OCC from the office paper before baling. The sorting could be done manually or with the use of the skid steer. This is a potential processing option for the City to explore; however, this option could prove to be too operationally challenging with existing staff and equipment.

If the City chooses to pursue collection of commingled fibers, R. W. Beck recommends accepting this material on a pilot basis in order to ensure that it is operationally viable to manually sort the two commodities. In addition, depending on the buyer of recyclable material, the City may be able to sell bales of OCC and office paper to brokers and end users. However, selling commingled fiber would reduce the value of the material.

In a dual-stream system, if the City had a contract with a private MRF, the City would have the option to take fiber material to the private MRF for processing. The City would potentially be able to receive a higher percentage revenue share for commercial fiber because of the higher quality of the material.

Cost of Service and Recommended Rate Structure

In this section, R. W. Beck provided the City with an understanding of how to structure rates for commercial recycling. The projected cost of service rates developed by R. W. Beck only account for the commercial recycling program. In designing rates to recover costs for the solid waste system, R. W. Beck recommends that the City conduct a more in-depth cost of service analysis that ensures recovery of the costs to operate all of the services and programs offered by the department.

When developing rates for commercial front load service, R. W. Beck typically allocates the cost of service into three components, summarized in Table 5-5.

Table 5-5
Cost of Service for Commercial Recycling Route

Component	Items Included	Allocation
Administration	Administrative costs, billing costs, container maintenance, etc.	Per customer
Collection	Driver salaries, vehicle purchase and maintenance, fuel, etc.	Per collection (or container)
Disposal/Processing	Landfill tipping fees or recycling processing costs	Per cubic yard

In order to incent commercial customers to recycle, R. W. Beck recommends that the City charge commercial recycling customers on an incremental cost basis. In other words, the City should set rates to recover only the collection portion of the cost of service. The other two portions of the cost will be recovered as follows:

- **Administration:** Since the majority of the commercial OCC customers are also refuse customers, most already pay for administrative costs via their refuse fees.
- **Disposal/processing:** The City's current cost of processing is $41 per ton. Typically, the revenue received from the sale of OCC and office paper exceeds this processing cost. Therefore, the processing component of the commercial recycling program will typically result in net revenue to offset the cost of the program. However, in the recent economic slowdown, the price of these commodities has in some cases fallen below the cost of processing. If this is the case, the R. W. Beck recommends that City recover this cost through a subsidy from commercial refuse rates.

Table 5-6 summarizes the collection costs for one commercial recycling route. These costs are based on the actual costs to operate the current recycling route.

Table 5-6
Collection Costs for Commercial Recycling Route

Account	Current
Salaries	$51,703
Vehicle costs	
Fuel	$19,000
Repairs and maintenance	$14,000
Replacement cost	$25,000
Shop overhead	$4,354
Total Collection	$114,057

R. W. Beck recommends that the collection cost be allocated to customers on a per-collection basis. Based on the projected number of collections for a full-capacity route shown in Table 5-4, the cost per stop for commercial recycling should be $5.48. Based on this cost per stop, the projected monthly fees for commercial recycling are shown in Table 5-7.

Table 5-7
Projected Commercial Recycling Monthly Fees

	Collections per Week				
Size	One	Two	Three	Four	Five
4 CY recycling [1]	$23.76	$47.52	$71.29	$95.05	$118.81
4 CY refuse	$65.52	$131.04	$196.56	$262.08	$327.60
% discount to refuse [2]	64%	64%	64%	64%	64%
6 CY recycling	$23.76	$47.52	$71.29	$95.05	$118.81
6 CY refuse	$98.28	$196.56	$294.84	$393.12	$491.40
% discount to refuse	76%	76%	76%	76%	76%

1. These rates were calculated based on 52 weeks per year divided by 12 months.
2. Represents the percent discount that the recycling rates represent to the refuse rates.

R. W. Beck emphasizes that the rates shown in Table 5-7 were designed to provide maximum incentive to recycle. These rates recover collection costs only and do not recover administrative or disposal/processing costs. There typically are administrative and disposal/processing costs associated with a commercial recycling program; however, the rates were designed to be as low as possible to provide the maximum incentive to recycle.

Based on R. W. Beck's analysis, the City has multiple options with regard to commercial recycling fees, including the following:

- **Keep the current rate structure.** The current rates for commercial OCC collection represent a 50 percent discount over refuse rates. Based on this analysis, these rates are sufficient to recover collection costs.
- **Provide a greater discount for recycling.** Based on R. W. Beck's analysis, the City could potentially provide a 64 to 76 percent discount to the refuse rates and still recover the collection costs associated with the program.
- **Include administrative and disposal/processing costs.** The City also has the option to design rates to recover the full cost of providing service, including administrative and disposal/processing costs. As discussed previously, disposal/processing costs are expected to be minimal.

5.2.2 Single-Stream Commercial Recycling Program

The City would have the opportunity to provide single-stream service to commercial customers only if the City transitioned to single-stream recycling for residential customers. This is because the collection and processing infrastructure (e.g., single-stream MRF) must be in place to provide single-stream service to commercial customers.

A single-stream program for commercial customers would primarily consist of two components, listed below.

- **96-gallon cart collection:** Small business in the City may be able to be served with 96-gallon recycling carts as an extension of the residential program. Commercial customers, depending on their location, could be collected as part of residential routes in order to maximize collection efficiency.
- **Front-load collection:** Larger businesses may need to have a front-load container to collect single-stream recyclables. If sufficient route density existed, these customers could have a dedicated route.

5.3 Food Waste Collection and Composting Program

In 2007, the City began a pilot program in which it accepts food waste material from Sam's Club for composting. On a temporary basis the Arkansas Department of Environmental Quality (ADEQ) allowed the City to begin this pilot program under a permit exemption. The conditions of the permit exemption include keeping the food waste composting area separate from the City's yard waste composting operation.

In this section, R. W. Beck provides an analysis of how the City can expand the food waste composting program and integrate it with the yard waste operation. This analysis provides the City with an understanding of how food waste collection can be provided to commercial customers and the rates that could be charged for this service.

5.3.1 Capacity for Processing Food Waste

Capacity

In 2008, the City is projected to compost approximately 5,127 tons of brush and yard waste material (see Section 1.4.1). Traditional yard waste composting operations can benefit from the addition of nitrogen-rich material (e.g., food waste) because the addition of food waste can yield a richer compost product. Without knowing the specific composition of the existing yard waste compost (e.g., amount of leaves, grass, tree trimmings), or the composition of the food waste, R. W. Beck cannot say with certainty the volume of food waste that can be integrated into the operation. However, based on industry experience, R. W. Beck would expect that up to 25 percent of the total compost volume could consist of food waste. In other words, since the City is projected to compost 5,127 tons of yard waste in 2008, the City could integrate up to approximately 1,700 tons of food waste. For the purposes of this analysis, R. W. Beck assumed maximum food waste processing capacity of 1,700 tons.

When implementing food waste composting, it will be critical for the City to introduce food waste material into the compost gradually over time in order to continually monitor and test the compost product. If the City gradually increases the amount of food waste accepted, it will allow staff to determine the optimal compost recipe for the City's operation.

Table 5-8
Capacity to Compost Food Waste

Material	Tons
Yard Waste	5,127
Food Waste	1,700
Total Material Composted	6,827

Options for Sourcing Food Waste Material

In order to source material for the food waste composting program, R. W. Beck recommends that the City begin by promoting the service to its current commercial refuse customers. Potential sources of food waste include:

- Supermarkets (including super centers and traditional grocery stores)
- Schools and universities
- Restaurants
- Institutional entities
- Agricultural entities
- Industrial and food manufacturers

The City has composted supermarket-generated produce for approximately one year as part of the pilot program with Sam's Club. As the City explores the possibility of

expanding this pilot into a full-scale operation, R. W. Beck recommends that the City continue to source produce-only material from supermarkets. This would allow the City to have control over feedstock and develop expertise in composting a particular type of food waste material. In the pilot program, Sam's Club has done a very effective job of keeping contaminants, such as plastic and other trash, out of the collected produce. If the City were to engage in a full-scale produce composting operation, it would be critical to educate grocery store customers to minimize contamination.

Using customer account data provided by the City, R. W. Beck identified the grocery stores that are currently refuse customers. These customers are listed in Table 5-9.

Based on knowledge of their current refuse container size and collection frequency, R. W. Beck estimated the total tons of MSW expected to be generated by each customer in one year.[3] Based on waste characterization studies done for other clients, R. W. Beck has an understanding of how much food waste is generated as a percent of the total waste stream in both grocery stores and super centers. R. W. Beck would expect for 40 percent of the total waste stream in a super center to be food waste and 70 percent of the total waste stream in a grocery store to be food waste.

Table 5-9
Potential Sources of Commercial Food Waste

Customer	Address	Container Size	Pick Ups/Wk	Estimated Tons MSW [1]	Estimated Tons Food Waste
Sam's Club	3081 Hwy 112	15	0.25	59	59
Wal-Mart (Super Center)	2346 W. 6th	4	2	312	125
IGA Thriftway (Grocery)	380 N. College	6	1	94	66
IGA Thriftway (Grocery)	380 N. College	6	6	562	393
Ozark Natural Foods (Grocery)	1554 N. College	6	3	281	197
Wal-Mart (Super Center)	3919 N. Mall	4	2	125	50
Marvin's IGA (Grocery)	Unknown	40	1	624	437
Total					1,325

1. R. W. Beck assumed that the MSW collected has a density of 600 lbs per cubic yard (based on information compiled by the U.S. Environmental Protection Agency).

R. W. Beck projected the food waste generated by the City's grocery store customers to be 1,325 tons. Based on these estimates, the City would have approximately 375 tons of excess capacity for food waste if all grocery store customers were to participate. This analysis is summarized in Table 5-9.

As previously mentioned, R. W. Beck recommends that the City gradually retain commercial food waste customers in order to ensure the appropriate composition of the compost feedstock. In order to promote the program to the customers listed in Table 5-9, R. W. Beck would recommend that the City approach each customer and

[3] This analysis assumes that containers are completely full for each scheduled collection.

emphasize the benefits of the program. The City should specifically emphasize any opportunity for the customer to reduce overall collection costs through this program.

After achieving full participation from all of the current grocery store customers, the City would have a number of options to fill the remaining 375 tons of food waste capacity in its system. One option would be to offer the service to grocery stores that are not currently refuse customers. In the course of this study, R. W. Beck did not identify any other waste haulers that offer food waste composting as a service. Therefore, the City would have a competitive advantage when marketing this service to potential customers.

5.3.2 Collection System

Containers

It is possible to conduct a food waste collection operation using traditional, steel front-load containers, much like in refuse operations. However, food waste can corrode metal, which can have a significant impact on container maintenance and replacement costs. Therefore, R. W. Beck would recommend that the City consider utilizing front-load containers made of high density polyethylene for this operation. See Figure 5-1 for an example of this type of collection container.

These containers come in sizes from one cubic yard to four cubic yards, but, for the purposes of this analysis, R. W. Beck assumed all customers would receive a four cubic yard container for food waste collection. Based on discussions with sales representatives, these four cubic yard containers cost approximately $700 each and come with a five-year warranty.

Figure 5-1: Potential Food Waste Collection Container

Frequency

Frequency of food waste collection depends largely on temperature and climate. During the summer and warmer spring months, the containers will need to be collected at least every other day, or three to four times per week. During the winter and cooler months of the year, the containers will need to be serviced less frequently, such as two to three times per week. For the purposes of this analysis, R. W. Beck assumed an average of three weekly collections per customer.

Collection Efficiency

Based on the amount of food waste projected to be generated by the potential customers, R. W. Beck estimated the number of weekly collections that would be needed. R. W. Beck assumed a minimum of three collections per week for these customers due to sanitary issues associated with allowing food waste to remain uncollected.[4] In the pilot program, Sam's Club currently delivers their food waste directly to the composting facility. For this analysis, R. W. Beck assumed that the City would maintain the current collection arrangement with Sam's Club.

Table 5-10 summarizes the number of pick-ups needed per week for each customer as well as a *possible* collection schedule. R. W. Beck emphasizes that the collection schedule shown is for illustration purposes only; it would be up to the City and its customers to establish an appropriate collection schedule for the food waste.

Table 5-10
Projected Collections per Week for Food Waste

Customer	CY/ Week	Pick-Ups/ Week	Mon	Tue	Wed	Thu	Fri	Sat
Sam's Club	n/a	n/a						
Wal-Mart	4	3	1		1		1	
IGA Thriftway	25	6	1	1	1	1	1	1
Ozark Natural Foods	13	3	1		1		1	
Wal-Mart	3	3	1		1		1	
Marvin's IGA	28	6	1	1	1	1	1	1
Total	73	21	5	2	5	2	5	2

As shown in the table, the City would need to collect approximately 21 stops per week of food waste, or between two and five stops per day. This number of customers does not justify a dedicated route. R. W. Beck would recommend that the City utilize excess capacity in the refuse collection system to service these containers. For instance, the first front-load refuse driver to finish their route each day would be sent back out to collect food waste from the customers scheduled for collection.

5.3.3 Processing System

Permit Modification

On a temporary basis, the ADEQ allowed the City to begin limited food waste composting at its existing facility under a permit exemption. In order to continue food waste composting at the existing facility, a type "O" permit is required. The City currently has a type "Y" permit for its composting facility. Therefore, in order to

[4] The City may wish to vary the collection frequency based on seasonality, allowing for fewer collections in cooler months.

accept food waste at its composting operation, the City would be required to apply for a major permit modification for the composting facility.

In-Vessel vs. Windrow Composting Systems

The City's current composting operation is an open, windrow system. In discussions with R. W. Beck, the City expressed general interest in implementing an in-vessel composting system in the event that they begin to compost food waste. In-vessel composting refers to a variety of composting technologies that allow material to be composted inside of a container. In-vessel composting systems provide several benefits over windrow composting, including:

- Greater control and containment of odors and gases
- Reduced land and space requirements
- Reduced labor requirements due to a more automated system
- A more consistent compost product
- Aesthetically pleasing facilities

Although in-vessel composting can provide many benefits, it typically has very high capital costs compared to windrow composting. Low volume composting operations, such as the one operated by the City, do not typically handle enough material to justify this level of capital investment. In addition, the City has already made a significant investment in its windrow composting system. In developing a food waste composting program, R. W. Beck would recommend that the City integrate the food waste material into the current, windrow composting system.

There can be odor that is produced in food waste composting systems. However, City staff report that there have been no odor issues at the City's current food waste composting pilot site. R. W. Beck would expect that this is largely due to the fact that only produce – as opposed to meats and dairy – is being composted. R. W. Beck would expect that if the City launched a full-scale produce composting operation that there would not be significant issues with odor. However, since the City would gradually introduce the produce into their system, they should be able to closely monitor any odor issues.

Capital Costs

In discussions with R. W. Beck, the City expressed that, if they were to implement full-scale food waste composting, they would want to construct a concrete pad at the existing yard waste composting operation. This site is approximately three acres. The City incurred a cost of $73,000 to lay concrete over a one-half acre site in 2007. Therefore, R. W. Beck estimates that, to construct a concrete pad at the three acre site would cost approximately $438,000. Assuming a 15 year useful life and five percent cost of capital, the annual amortized cost would be $42,198.[5]

[5] The current economic downturn may make it difficult for the City to obtain financing for this time period at this interest rate. Upon deciding construct the pad, the City would need to revisit this issue and confirm that they would be able to obtain these financing terms.

Constructing the concrete pad represents a significant level of capital investment for the City as well as a large financial commitment toward the food waste composting program. R. W. Beck recommends that the City further evaluate whether the concrete pad would be a regulatory or operational requirement for the food waste composting operation. In addition, if the concrete pad would be required, R. W. Beck recommends that the City conduct more in-depth market research (e.g., talking with potential customers) before moving forward with implementing the program.

5.3.4 Food Waste Collection Rates

R. W. Beck developed preliminary cost of service rates that could be charged to customers to recover the cost of providing food waste collection service. Table 5-5 summarizes the types of costs that would need to be recovered from customers. As with the commercial recycling analysis, R. W. Beck would recommend that food waste collection rates be developed on an incremental cost basis in order to encourage participation from customers. In other words, the City should recover only the incremental costs associated with providing the service. The rates shown below were designed to provide the maximum incentive for the customer to participate in the program while still recovering the incremental cost of providing the service.

Following is a description of the incremental costs that would need to be recovered by food waste collection customers.

- **Administration (allocated on a per-container basis):** The primary incremental cost associated with food waste collection would be the plastic front-load containers. As previously mentioned, the carts cost $700 each. With a five year useful life, the monthly cost of each container to the customer would be $11.67. Because of the five year warranty, R. W. Beck did not include any provision for container maintenance.
- **Collection (allocated on a per-collection basis):** For the purposes of this analysis, R. W. Beck assumed collection costs for food waste would be the same as for commercial recycling as shown in Table 5-7.
- **Disposal/Processing (allocated on a per-cubic yard basis):** The primary processing cost associated with food waste processing would be the construction of the concrete pad. The annual cost of the concrete pad would be $42,198.[6] The City would compost up to approximately 6,827 tons of material per year; therefore, the cost of the concrete pad would be $6.18 per ton, or $4.64 per cubic yard of food waste.[7]

Table 5-11 shows the projected commercial food waste collection rates. As shown in the table, the projected food waste collection rates would represent a slight discount to current commercial refuse rates.

[6] R. W. Beck assumed that this cost would be recovered from all of the customers that utilize the composting operation. If the City constructed the pad, they would be required to increase processing fees for all customers, not just food waste customers.

[7] One cubic yard of food waste is approximately 1,500 lbs. Therefore, food waste has approximately 0.75 tons per cubic yard. $6.14*0.75 = $4.64.

Table 5-11
Projected Commercial Food Waste Collection Monthly Fees

	Collections per Week				
Size	Two	Three	Four	Five	Six
4 CY Food Waste [1]	$118.76	$172.31	$225.86	$279.41	$332.96
4 CY Refuse	$131.04	$196.56	$262.08	$327.60	$393.12
% discount to refuse [2]	9%	12%	14%	15%	15%

1. These rates were calculated based on 52 weeks per year divided by 12 months.
2. Represents the percent discount that the recycling rates represent to the refuse rates.

5.4 Commercial Refuse Rates

R. W. Beck evaluated the City's current refuse rates in order to provide recommendations as to how these rates can be structured to encourage recycling. Table 5-12 shows the current front-load refuse rates charged by the City.

Table 5-12
Current Commercial Front-Load Refuse Rates

	Collections per Week				
Size	One	Two	Three	Four	Five
4 CY	$65.52	$131.04	$196.56	$262.08	$327.60
6 CY	$98.28	$196.56	$294.84	$393.12	$491.40
8 CY	$131.04	$262.08	$393.12	$524.16	$655.20

The current refuse rate structure is *volume-based*. In other words, refuse customers pay approximately $16.38 for each cubic yard of disposal capacity. For example, a customer who disposes of a four cubic yard container twice per week pays the same rate as a customer that disposes of an eight cubic yard container once per week.

The current rate structure provides incentive for customers to recycle as much as possible. However, it does not necessarily encourage efficient use of the solid waste system. For instance, typically, solid waste rates would be structured in such a way that it would be less expensive for a customer to have an eight cubic yard container collected once per week rather than a four cubic yard container collected twice per week because of the cost associated with the additional collection.

The City also has the option to encourage customers to recycle by subsidizing the recycling and organics collection programs with revenue from the refuse rates. For instance, if the City wanted to provide a $50,000 subsidy for the diversion programs, it could structure refuse rates to recover an additional $50,000 over the cost of service.

5.5 Key Findings and Recommendations

5.5.1 Maximize the Existing Commercial Recycling Program

Because of the success they have had in adding customers to the commercial recycling program, the City has made the decision to operate a designated route for this service. The following summarizes R. W. Beck's recommendations as to how the City can maximize this existing recycling route.

Adding Customers to the Program

R. W. Beck recommends that the City maximize its current recycling route by targeting 80 stops per day on the route. The City will need to make a concerted effort to add customers in order to achieve the 80 stops per day target. The following represents specific tactics that may be employed to increase the number of commercial recycling customers.

1. **Assign one staff person within Solid Waste with the responsibility to increase the number of commercial recycling customers.** This responsibility would ideally be taken on by someone within a management role, such as the Waste Reduction Coordinator or Solid Waste Director.

2. **All Solid Waste collection staff can help increase the number of commercial recycling customers.** While on route, refuse collection drivers can monitor the content of dumpsters to identify customers that may have a significant amount of recyclable fiber. This information should be provided to the staff person responsible for increasing the number of commercial recycling customers.

3. **Staff should encourage commercial customers to participate in the commercial recycling program by demonstrating opportunities for businesses to reduce their costs.** Staff should help businesses evaluate their options by conducting informal waste audits. In cases where a business is able to reduce its solid waste collection costs, Solid Waste staff should develop written information to publicize this.

In addition to the tactics listed above, R. W. Beck would recommend the following regarding adding customers to the commercial recycling program.

4. **In recruiting customers for the recycling route, the City should place an emphasis on retaining customers that are in close proximity to one another**. Higher route density will lead to increased collection efficiency and potentially allow the City to exceed 80 stops per day on route.

5. **In addition, as the program grows, the City may fill up the existing route and have an opportunity to expand to include another recycling route.** If this is the case, the City should attempt to use excess capacity on refuse routes to collect the additional customers until enough density exists for a dedicated route. This is similar to the process that the City went through to develop the current program.

Expand the Materials Collected

R. W. Beck believes that it would be feasible to collect both OCC and office paper as part of this program. This would require manual sorting of the two commodities at the City's processing facilities. As such, R. W. Beck recommends the following:

1. **The City should consider accept commingled office paper and OCC on a pilot basis** in order to ensure that it is operationally viable to manually sort the two commodities.
2. **The City should investigate whether it would be possible to sell bales of commingled OCC and office paper to brokers and end users.**

5.5.2 Consider Implementing Food Waste Collection

Based on this analysis, R. W. Beck believes that it is feasible for the City to collect food waste from commercial customers and would recommend that the City further consider implementing this type of program. R. W. Beck's key findings and recommendations regarding food waste collection and composting are as follows.

1. **The City could integrate up to approximately 1,700 tons of food waste into its current composting operation.** Accepting food waste in the current compost operation will require the City to obtain a permit modification from ADEQ. When implementing food waste composting, it will be critical for the City to gradually increase the amount of food waste feedstock in order to continually monitor and test the compost product.
2. **R. W. Beck recommends that the City source produce only from supermarkets.** This would allow the City to have control over feedstock and develop expertise in composting a particular type of food waste.
3. **The City should gradually retain commercial food waste customers in order to ensure the appropriate composition of the compost feedstock.** The City should approach each potential customer and emphasize the benefits of the program, specifically any opportunity for the customer to reduce overall collection costs.
4. **The City should utilize excess capacity in the refuse collection system to service food waste customers.** For instance, the first front-load refuse truck to finish their route each day would be sent back out to collect food waste from the customers scheduled for collection.
5. **Constructing a concrete pad at the compost site would represent a significant capital investment for the food waste composting program.** R. W. Beck recommends that the City further evaluate whether a concrete pad would be an operational or regulatory requirement for the food waste composting program. If it is a requirement, R. W. Beck recommends that the City conduct more thorough market research (e.g., talking with potential customers) before moving forward with the program to justify the capital investment for the pad.

6. **In developing a food waste composting program, the City should integrate the food waste material into the current, windrow composting system.**

5.5.3 Encourage Diversion through Service Rates

The City should structure its recycling and refuse rates in such a way to encourage diversion of material. Following are R. W. Beck's key findings and recommendations regarding rates for commercial refuse and recycling service.

1. **The City should maintain the current rates for commercial recycling.** The current rates for commercial recycling are sufficient to recover the incremental cost of providing the service and also encourage diversion.
2. **The City has the opportunity to set food waste collection rates that represent a nine to 15 percent discount to refuse rates.**
3. **The current commercial refuse rate structure provides incentive for customers to recycle as much as possible.** The current refuse rate structure is volume-based.

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Section 6
Apartment Recycling Analysis

6.1 Overview

The City currently has a drop-off center that is open for use to all City residents, including apartment residents. In this section, R. W. Beck provided an evaluation of the current drop-off center. In addition, R. W. Beck presented three options for the City to expand apartment recycling, including:

- Expand the drop-off program
- Include apartment complexes on curb-sort routes
- Provide single-stream recycling service

R. W. Beck's key findings and recommendations pertaining to the drop-off program and the potential recycling options are included at the end of this section.

6.2 Evaluation of Current Drop-Off Program

6.2.1 Description of Current Program

The City of Fayetteville provides a 24-hour drop-off recycling center that is located on Happy Hollow Road adjacent to the transfer station and MRF (see Figure 6-1). Although the drop-off does not have an attendant, the proximity to the MRF allows for close monitoring by solid waste staff. Recyclables are source separated and collected in roll off containers. Containers are hauled as-needed to the City's MRF and the material is processed with recyclables collected from the City's various recycling programs (e.g., residential curbside, commercial OCC).

Figure 6-1: City of Fayetteville Recycling Drop-Off Center

Materials accepted at drop-off center include:

- Aluminum cans
- Plastic bottles #1 (PET)
- Plastic bottles #2 (HDPE)
- Steel cans
- Glass beverage containers (green, clear, and brown)
- Newspaper
- OCC
- Paperboard or chipboard
- Junk mail, office paper and magazines

6.2.2 Evaluation of Current Program

Benchmarking

In order to thoroughly assess the City's drop-off program, R. W. Beck compared it to drop-off programs in place in other communities. R. W. Beck utilized its internal database of recycling programs in order to identify appropriate cities for this analysis. The following cities were chosen for benchmarking:

- Sherwood, Arkansas
- Huntsville, Texas
- Texas City, Texas
- Bay City, Texas

The selected communities have relatively comparable populations and are located in the Southwest region of the United States. Table 6-1 shows summary information for the drop-off programs in each of these cities.

Table 6-1
Benchmark Drop-Off Program Summary

City	Population [1]	# of Drop-Off Centers	Staffing	Collection Method
Fayetteville, AR	68,924	1	No	Source-separated
Sherwood, AR	23,149	2	No	Source-separated
Huntsville, TX	37,537	1	Yes	Source-separated
Texas City, TX	45,070	1	Yes	Source-separated
Bay City, TX	18,263	1	Yes	Source-separated

1. Source: United States Census Bureau, 2006 population estimates

Participation and Material Recovery

The City's drop-off center currently collects 1,113 tons of recyclables on an annual basis. This level of diversion results in a 4.5 percent residential recycling rate without taking into consideration the City's other residential programs (e.g., curbside, composting).[1] This level of diversion is strong compared to other drop-off programs. In addition, with 118 pounds of material per household, the City's drop-off diversion is comparable to benchmark cities. This analysis is summarized in Table 6-2.

Table 6-2
Annual Diversion for Benchmark Drop-Off Programs

City	Total Tons	Lbs/Household
Fayetteville, AR	1,113	118
Sherwood, AR	459	111
Huntsville, TX	404	78
Texas City, TX	729	114
Bay City, TX	367	106

City staff reports that the current drop-off center has strong participation; however, it is unknown how many of the participants are multi-family residents.

Operating Hours

Table 6-3 summarizes the operating hours for the benchmark programs. As shown in the table, many of the benchmark programs have limited operating hours in order to have an attendant on-site to monitor customers and ensure proper use of the facility. Since the City does not have an attendant, limited operating hours are not needed.

Table 6-3
Operating Hours for Benchmark Programs

City	Mon	Tues	Wed	Thu	Fri	Sat	Sun
Fayetteville	24 hr	24 hr	24 hr	24 hr	24 hr	24 hr	24 hr
Sherwood	24 hr	24 hr	24 hr	24 hr	24 hr	24 hr	24 hr
Huntsville	7:30 am-5:00 pm	7:30 am-5:00 pm	7:30 am-5:00 pm	7:30 am-5:00 pm	7:30 am-5:00 pm	7:30 am-5:00 pm	Closed
Texas City	8:00 am-4:00 pm	8:00 am-4:00 pm	8:00 am-4:00 pm	8:00 am-4:00 pm	8:00 am-4:00 pm	8:00 am-4:00 pm	12:00 pm-4:00 pm
Bay City	8:00 am-5:00 pm	8:00 am-5:00 pm	Closed	8:00 am-5:00 pm	8:00 am-5:00 pm	8:00 am-5:00 pm	Closed

[1] See Table 2-5 in Section 2 – Evaluation of Current Residential Recycling System.

Contamination of Materials

The contamination rate of materials collected at the City's drop-off center is not specifically tracked, however, City staff report that contamination is minimal. Typically unstaffed drop-off centers experience greater challenges with contamination. But, the drop-off's location adjacent to the transfer station and MRF allows for close monitoring of the site by solid waste staff. R. W. Beck would typically recommend that recycling drop-off centers have an attendant; however, at this particular drop-off center, staffing is not needed at this time. Should the City choose to construct additional drop-off centers that are not located near the transfer station, staffing may be necessary to ensure low contamination, prevent illegal dumping, and maintain general site cleanliness.

Fayetteville also uses roll-off containers with slot openings that are sized and shaped according to the commodity collected. For example, OCC containers have slots that are long and narrow which prevent a resident from placing a plastic container inside. These containers also contribute to the quality of collected material.

Public Education and Signage

Currently, all public education related to the drop-off center is part of the City's overall public education campaign for solid waste. Public education efforts are generally not targeted to specific residents (e.g., apartment residents).

Signage is located on all containers at the City's drop-off recycling center. The signs describe, using descriptive text, what materials should be placed in each container. R. W. Beck would recommend that the City move away from text-only signage and begin to utilize signs with more graphics (see Figure 6-2). In addition, the City has affixed examples of acceptable materials to some of the roll-off containers (e.g., detergent bottles, soda bottles). Signage with graphics would eliminate the need for this and improve the general aesthetics of the site. However, since the City's contamination rate is low, this is not an immediate need.

Figure 6-2: Drop-Off Center Signage

Cost of Service

R. W. Beck conducted a cost of service analysis for the City's drop-off center utilizing annual budget data that was provided by the City. The cost of service analysis was conducted for FY 2008.

R. W. Beck isolated some of the drop-off center costs from the costs to operate the other recycling programs (e.g., drop-off container maintenance). However, most of the program costs are shared among all of the City's recycling programs (e.g., MRF operating costs). For costs that are shared among all of the recycling programs, R. W. Beck allocated those costs on a tonnage basis. In other words, since drop-off recycling represents 14 percent of the City's recycling tonnage, 14 percent of the shared recycling costs were allocated to the drop-off program.[2]

R. W. Beck also included revenue from recyclables as an offset to costs in this analysis. As shown in Section 2.3.3, the value of a ton of the City's material in the status quo system is $95. R. W. Beck multiplied $95 by 1,113 tons to project revenue of $105,735 for the drop-off center. R. W. Beck based the projected revenue for this analysis on the commodity price analysis in Section 1 (see Table 1-6).

Because the drop-off program is a service that is made available to both single-family and multi-family residents, R. W. Beck would recommend that the City recover the cost of providing the service from all households. The number of multi-family households in the City is 11,058[3]; therefore, there are 29,888 total households in the City.[4]

Table 6-4 summarizes the drop-off cost of service. As shown in the table, the City's drop-off program provides $29,924 of revenue on a monthly basis.

Table 6-4
Current Drop-Off Recycling Cost of Service

Account	Total Cost	Per Household [1]
Personnel	$17,142	$0.05
Materials and supplies	$6,513	$0.02
Services and charges	$21,911	$0.06
Vehicle Costs	$9,286	$0.03
Maintenance	$1,303	$0.00
Capital	$1,820	$0.01
Depreciation	$17,836	$0.05
Cost of Service	$75,811	$0.21
Revenue from Recyclables	$105,735	$0.29
Net Cost/(Revenue)	($29,924)	($0.08)

1. Includes single family and multi family households, or 29,888 households total.

Because of the great variability in drop-off program design, cost of service can vary considerably. In addition, because of the level of effort and analysis required to calculate cost of service for specific programs, many cities do not have current cost of

[2] A detailed analysis of the City's recycling programs and tonnage can be found in Section 1.
[3] Source: Center for Business and Economic Research at the Sam Walton College of Business *The Skyline Report Q2 2008*
[4] 18,830 single family + 11,058 multi family = 29,888 households

service information. Therefore, R. W. Beck does not have an extensive database of drop-off program cost of service data to use for purposes of comparison.

As shown in the table, revenue from the sale of recyclables recovers more than the total cost of the drop-off program. This is primarily due to the following reasons:

- Since the drop-off site is located at the MRF, the City does not incur substantial hauling costs.
- The 24-hour nature of the site means that operating costs are minimal.
- Strong resident participation increases the revenue generated.
- Revenue generated from the sale of commodities offsets low operating costs.

6.3 Options to Expand Apartment Recycling

6.3.1 Expand Drop-Off Program

One option for the City to increase apartment recycling is to develop an additional drop-off center. In order to attract apartment residents, R. W. Beck would recommend that this center be developed in an area with a high density of apartment complexes.

Assumptions

Below are R. W. Beck's assumptions for this analysis.

- The material generation level would be approximately equal to the current drop-off site. R. W. Beck assumed 1,113 tons per year.
- The site would be staffed and include security mechanisms such as lighting and fencing.
- The material generated at the site would have minimal contamination. As such, R. W. Beck did not include residual disposal costs in this analysis.
- The City's average cost of capital is five percent.[5] All site and building costs would be financed over a 15 year period. The useful life for roll-off containers would be 10 years.
- Land cost will vary depending on the location and the ultimate size of the plot needed. Without an understanding of these factors, it is difficult to develop specific cost estimates for land acquisition. Therefore, for the purpose of this cost estimate, R. W. Beck assumed the site would be constructed on City-owned land.

Capital Costs

The cost estimates presented in this section were developed on a planning-level basis and are intended to provide an understanding of the relative costs associated with a

[5] The current economic downturn may make it difficult for the City to obtain financing for this time period at this interest rate. Upon deciding to develop a facility, the City would need to revisit this issue and confirm that they would be able to obtain these financing terms.

recycling drop-off center. As such, R. W. Beck provided capital cost estimates in a range of low to high expected costs.

Based on knowledge of similar facilities, R. W. Beck would expect that a recycling drop-off would cost between $65,000 and $110,000 to construct. This estimate includes items such as concrete, attendant building, fencing, utilities, and signage. These cost estimates represent between $6,262 and $10,598 on an annual, amortized basis.

A typical drop-off center can be constructed on less than one acre of land. However, the space needed varies depending on the services that are being provided to citizens and the facility design.

The City would also incur capital cost associated with enclosed recycling roll-off containers. R. W. Beck assumed that the City would need nine of these containers, similar to the existing site. R. W. Beck estimates that these containers cost between $6,000 and $8,000 each. Table 6-5 summarizes the capital cost estimates for the drop-off center.

Table 6-5
Drop-Off Recycling Capital Cost

Account	Low	High
Site construction	$65,000	$110,000
Containers	$54,000	$72,000
Total	$119,000	$182,000
Amortized	*$13,255*	*$19,922*

Operating Costs

Labor

R. W. Beck assumed for this analysis that the additional drop-off center would be staffed and open for 40 hours per week. Only one attendant would be needed to staff the site during the week. R. W. Beck assumed that 1.25 FTE employees would be needed to staff the site in order to provide backup staff when the regular attendant is out. With an assumed annual salary of $25,000 and assumed benefits cost of one-third of salary costs, the cost for the attendant would be $41,667.[6] R. W. Beck also included the cost of one FTE roll-off driver in this analysis. Salary and benefits costs of $51,703 were included in this analysis to fund this position.

Hauling

Since the additional drop-off center would not be located at the MRF and transfer station, the City would incur hauling costs associated with the new operation. At the existing drop-off site, the City makes approximately 16 pulls per week; therefore,

[6] (25,000 + $8,333)* 1.25 FTE = $41,667

R. W. Beck assumed that the City would pull an average of 16 containers per week from the additional site.

Based on budget information provided by the City for 2008, the City incurs a cost of approximately $175 per haul for the roll-off operation.[7] Therefore, the projected hauling cost for the additional drop-off center would be $145,600.

Processing

Based on analysis summarized in Section 2.4, it costs $41 per ton to process material in the City's MRF. Based on projected material recovery of 1,113 tons, processing costs would be $45,633.

Container Maintenance

R. W. Beck estimated that container maintenance costs would be approximately five percent of the purchase price on an annual basis. Therefore, container maintenance costs would be approximately $3,150 per year.[8]

Other Operating Costs

R. W. Beck estimated additional operating costs as shown below.

- Utilities: $1,200 annually
- Site Maintenance: $2,500 annually
- Administrative: $1,200 annually

Summary

Table 6-6 summarizes the cost estimates for the additional drop-off center. As shown in the table, the drop-off center is projected to cost between $200,173 and $206,840 to operate on an annual basis.

[7] This number was derived by dividing the total budget for the roll-off operation, excluding disposal, by the projected number of pulls for 2008.
[8] Based on an average container cost of $7,000.

Table 6-6
Cost Estimate for Drop-Off Center

Account	Low	High
Capital Costs		
Construction	$6,262	$10,598
Containers	$6,993	$9,324
Subtotal	$13,255	$19,922
Operating Costs		
Labor	$93,370	$93,370
Hauling	$145,600	$145,600
Processing	$45,633	$45,633
Container maintenance	$3,150	$3,150
Utilities	$1,200	$1,200
Site maintenance	$2,500	$2,500
Administrative	$1,200	$1,200
Subtotal	$240,950	$240,950
Total Cost	$305,908	$312,575
Revenue from Recyclables	$105,735	$105,735
Net Cost	$200,173	$206,840
Per household (monthly)	$0.56	$0.58

6.3.2 Include Apartment Complexes on Curb-Sort Routes

Another option for the City to increase apartment recycling is to provide on-site recycling service using the residential curb-sort routes. This program is being conducted on a pilot basis with the Maple Street Apartments (see Figure 6-3).

Figure 6-3: Curb-Sort Apartment Recycling Pilot Program

Barriers to Implementation

R. W. Beck typically recommends that on-site apartment recycling programs be done on a city-wide, mandatory basis. This serves to level the playing field so that all complexes incur the costs associated with recycling. **However, in R. W. Beck's opinion, the current system is not a viable option for a mandatory, City-wide apartment recycling program because there are significant barriers to implementation, as listed below**:

- **Size of complexes:** The current pilot program is being conducted at a relatively small apartment complex with 28 units. However, there are many extremely large apartment complexes in the City, some having hundreds of units and up to 30 refuse dumpsters. Large complexes would be extremely challenging to service with a curb-sort program due to the number of containers that would be needed to collect material.
- **Contamination:** Contamination can be an issue in any on-site apartment recycling program. However, the curb-sort processing system that the City has in place cannot manage contamination like a typical MRF because it does not have the personnel or equipment needed to sort recyclables from non-recyclables. The high quality of material (i.e., very low contamination) that is required for the curb-sort processing system will not be achievable for most apartment complexes.
- **Management buy-in and level of effort:** The management of the Maple Street Apartments is extremely committed to resident education to ensure proper participation in the recycling program. A similar level of effort would be required by participating apartment complex managers in order to ensure acceptable quality of collected material. In addition, the material, especially fibers, must be covered when it rains so that it does not get wet. This also requires the involvement of the apartment complex manager (i.e., taking the containers inside during wet weather). Having a resident apartment manager is also ideal for this type of program.
- **Collection containers:** The options for collection containers discussed in this section are not ideal to service apartments. Typically apartment complexes have rolling carts or dumpsters for collection of recyclables. The open-top bins have been sufficient for the pilot program at Maple Street, but could be challenging for other complexes that do not have experience managing the program.
- **Space required:** Both large and small complexes will have to dedicate a sufficient amount of space to the recycling program (see Figure 6-3). Some complexes may not have space available for this program, while others may not be willing to give up parking spaces or other useful space for the program.
- **Billing system:** Some of the City's apartment complex customers are billed on a master-meter basis while others are individually metered in each unit. Therefore, providing a City-wide apartment program would present a significant challenge with regard to billing.

Based on R. W. Beck industry experience, the curb-sort system is not feasible to implement on a large-scale basis. In addition, if the City were to implement the program on a large-scale basis, it would likely require additional personnel and

equipment. However, this section contains some discussion and preliminary analysis of how the residential program could be extended to a small number of apartment complex customers without adding additional staff or equipment.

Customers

Based on a review of the City's account data, the City has approximately 200 apartment complex customers. As discussed above, if the City chooses to implement this program, it should be administered on a limited, small-scale basis. R. W. Beck recommends that the City limit participation to 40 complexes, which represents approximately 20 percent of current apartment customers. In addition, the City should reserve the right to recommend that specific complexes not participate, such as extremely large complexes. As previously mentioned, this program would require a significant level of effort by apartment complex managers, in addition to the financial cost. Therefore, R. W. Beck does not expect that there would be substantial political challenges with limiting the program to a small number of customers.

Containers

R. W. Beck would recommend that participating apartment complexes be provided the option of what type of recycling container to use for the program. The apartment complexes should incur the cost of purchasing these containers. Following are two styles of containers that could potentially be used for this collection.

- **Current, open-top bins (see Figure 6-3):** The complex manager would need to purchase at least 10 containers, or one for each material collected. However, there will likely be a need to purchase additional containers, as the pilot program at Maple Street utilizes about 20 containers (for less than 30 units). The containers cost $9 each, including the lid.
- **Shelter system (see Figure 6-4):** Shelter systems would be a more permanent container at the apartment complex and typically can sort between two and six commodities. Shelter systems cost between $500 and $1,000 each, depending on the design, manufacturer, and quantity ordered.

Figure 6-4: Example of a Recycling Shelter System

As previously mentioned, there are challenges associated with each style of container. The open-top bins, while inexpensive and easy to handle by the recycling drivers,

require hands-on management by apartment staff. For instance, the recyclable material cannot be left outside in the rain, and the complex would be responsible for re-locating the bins in the case of inclement weather. These bins are also not as aesthetically pleasing to be placed at the complex. However, there are also challenges associated with shelter systems. Depending on the size of container that is put inside the shelter system, it could be challenging and potentially unsafe for the driver to unload the material into the truck. The recycling trucks were specifically designed for collection of open-top bins. In addition, shelter systems will make it more difficult for the apartment complex managers to identify contamination.

There are significant challenges with each type of container. If the City were to implement this program, R. W. Beck would recommend that City staff work very closely with each customer to determine the most appropriate type of collection system to put into place.

Collection

Based on analysis summarized in Section 2.2.6, the City's nine curb-sort routes have excess capacity. The current average route size is 523 stops, and R. W. Beck found that the curb-sort routes have a capacity of 600 stops. Therefore, the City's routes have an excess capacity of approximately 75 single family residential stops.

Apartment complex stops will likely consume more route time than single family stops due to the number of containers serviced, quantity of material collected, and lack of route density. R. W. Beck has assumed maximum program capacity of about 40 complexes. Therefore, since the City runs 36 routes on a weekly basis, each route would have to collect an average of about one apartment complex per day to service these customers.

R. W. Beck would expect that each route serving one apartment complex per day is operationally feasible given that the apartment complexes are located in the vicinity of the single family residential route. R. W. Beck would recommend that apartment complexes be routed according to their coordination with single family routes.

Cost of Service

R. W. Beck provided detailed analysis of the curbside-sort cost of service in Section 2.4. As shown in this analysis, the cost of service per single family household for this service is $3.56 on a monthly basis, excluding the avoided cost of disposal (see Table 2-17).

R. W. Beck believes that the cost to provide service to multi-family customers would be less than $3.56 per household for the following reasons:

- Multi-family residents would likely generate less material per household than single-family residents. In fact, based on benchmarking of on-site programs in cities in the United States, multi-family residents can generate between 10 and 50 percent of volume that single-family residents generate per household.[9]

[9] Source: *City of Fort Worth Multi-Family Recycling Study*, prepared by R. W. Beck, September 2005

- Because apartment complexes allow many homes to be serviced with one stop, it requires a lower level of effort to service a multi-family household than a single family household. In other words, there are operational efficiencies that are achieved with being able to service many customers in one stop, thus lowering the cost of service.
- Multi-family programs typically have lower participation rates than single-family programs, contributing to a less material being set out for collection.
- Since the multi-family program would simply be an extension of the single-family program, there are few costs that would be directly attributable to this program.

Because of the lower cost of service for multi-family customers as opposed to single-family customers, R. W. Beck would expect that the City could charge a 25 to 50 percent discount to apartment customers and still recover the cost of providing service. However, this would ultimately be a policy decision for the City to decide how much of a discount to provide to apartment residents for recycling service.

6.3.3 Provide Single-Stream Recycling Service

The City would have the opportunity to provide single-stream service to apartment customers only if the City transitioned to single-stream recycling for residential customers. This is because the collection and processing infrastructure (e.g., single-stream MRF) must be in place to provide single-stream service to apartment customers.

R. W. Beck would recommend that a single-stream program for apartment complexes be an extension of the single family program. Apartment complexes may be served with the 96-gallon recycling carts that would be provided to single family residents. Apartment customers, depending on their location, could be collected as part of residential routes in order to maximize collection efficiency.

If the City implemented single stream recycling for apartment complexes, R. W. Beck would recommend making participation mandatory. This will ensure that apartment complexes compete on a level playing field, since each complex is burdened with costs associated with recycling.

6.4 Key Findings and Recommendations

6.4.1 Continue Successful Drop-Off Program and Consider Program Expansion

The City has a strong drop-off program that performs well financially as well as with material diversion. Following are R. W. Beck's key findings and recommendations regarding the drop-off program.

1. The drop-off center provides $0.08 in revenue per household on a monthly basis. In addition, the drop-off center alone diverts 4.5 percent of the City's residential material.

2. It is unknown how many of the current drop-off participants are multi-family residents. In order to increase apartment diversion, R. W. Beck recommends that the City develop a public education campaign that is targeted to apartment residents to encourage use of the drop-off center.

3. As the City replaces the signage at the drop-off center, R. W. Beck recommends that the City move toward using signage with graphics rather than text-only.

4. The City would incur a cost of between $0.56 and $0.58 per household to develop an additional drop-off center. R. W. Beck recommends that the cost of this facility be recovered from single-family and multi-family residents.

6.4.2 Options for On-Site Apartment Recycling are Limited

Based on R. W. Beck industry experience, the curb-sort system is not feasible to be implemented on a large-scale basis. However, R. W. Beck provided some discussion and preliminary analysis of how the residential program could be extended to a small number of apartment complex customers without adding additional staff or equipment. In addition, R. W. Beck provided some discussion on single-stream recycling. Following are R. W. Beck's key findings and recommendations regarding options to provide on-site recycling service.

1. In R. W. Beck's opinion, the current system is not a viable option for a mandatory, City-wide apartment recycling program because there are significant barriers to implementation. These barriers include, but are not limited to: large size of the apartment complexes, contamination issues, management buy-in, collection container problems, space required for the collection area, and the billing system.

2. It would be potentially feasible for the City to include up to 40 apartment complexes on the current, curb-sort recycling routes for single family, or approximately one apartment complex per route each day. R. W. Beck would expect that each route serving one apartment complex per day is operationally feasible given that the apartment complexes are located in the vicinity of the single family residential route. If the City were to implement a small-scale program, it would be important to reserve the right to not serve very large apartment complexes.

3. The City would be able to provide single-stream service to apartment customers only if the City transitioned to single-stream for residential customers. R. W. Beck would recommend that a single-stream program for apartment complexes be an extension of the single family program.

Section 7
Construction and Demolition Recycling

7.1 Overview

In this section, R. W. Beck provided an analysis of the feasibility to develop a construction and demolition (C&D) recycling facility. As part of this analysis, R. W. Beck estimated the volume and composition of C&D material generated in the City as well as in Northwest Arkansas.

There are numerous options for the type of C&D recycling facility that the City could develop. In this analysis, R. W. Beck examined the financial feasibility of three options for the facility, listed below.

- Regional (large-scale) C&D MRF
- Local (small-scale) C&D MRF
- Manual sorting at the transfer station

These three options represent the broad spectrum of the resources, capital, and level of effort required to develop a C&D recycling facility.

R. W. Beck provided estimated costs for the three options listed as well as an assessment of the whether these options could financially compete with other disposal alternatives in Northwest Arkansas (e.g. Type IV landfills). The prices for other disposal options are listed below:

- City's current cost of disposal - $24.47 per ton
- Gate fee at Waste Management Tontitown Type IV landfill - $35.50 per ton [1]

The cost estimates presented in this section were developed on a planning-level basis and are intended to provide an understanding of the relative costs associated with each type of facility. As such, should the City move forward and develop a C&D recycling facility, R. W. Beck would recommend conducting a more thorough analysis of the preferred option.

In addition, R. W. Beck would emphasize that the assumptions in this analysis are associated with the minimum level of effort that would be needed to develop any of the three processing facilities. In other words, this analysis generally describes the minimum capital and operational requirements that would be needed to develop these processing facilities.

[1] Does not include taxes or fees.

7.2 C&D Waste Stream

This section discusses R. W. Beck's estimates of the volume and composition of the C&D waste generated in the City and in Northwest Arkansas.

7.2.1 Volume of C&D Material

The City's collects C&D material as part of its commercial roll-off (drop-box) program and does not record C&D tonnage separately from MSW tonnage. Therefore, data regarding the amount of C&D hauled by the City is not available. However, based on a review of the City's drop-box collection data, R. W. Beck estimates that the City hauled between 4,000 and 6,000 tons of C&D material in 2007, which represents approximately half of the drop-box tonnage collected.

A C&D recycling facility is often a regional operation due to economies of scale that can be achieved by accepting waste generated throughout several communities. Therefore, R. W. Beck estimated the annual C&D waste generation for Northwest Arkansas – including Washington and Benton Counties – by assuming a per-capita generation rate of 2.8 pounds per day based on a study conducted by the U.S. Environmental Protection Agency (EPA).[2] These estimates are summarized in Table 7-1. Based on this analysis, approximately 200,000 tons of C&D waste is generated in Northwest Arkansas on an annual basis.

Table 7-1
Estimated Annual C&D Waste Generation in Northwest Arkansas

County	Population	C&D Generation (tons)
Washington	194,292	99,283
Benton	203,107	103,788
Total	397,399	203,071

7.2.2 Composition of C&D Waste Stream

The estimated composition of the City's C&D waste stream is shown in Table 7-2. There is no C&D waste characterization data available for the City. Therefore, R. W. Beck estimated the composition of the C&D waste stream based on previous visual waste characterization work completed for other communities. Specifically, R. W. Beck used data collected in 2007 to evaluate the feasibility of developing a C&D MRF in the Dallas-Fort Worth Metroplex.[3]

For this analysis, R. W. Beck separated C&D materials into two categories: recoverable material and non-recoverable material. Recoverable materials represent

[2] Source: U.S. Environmental Protection Agency, *Characterization of Building-Related Construction and Demolition Debris in the United States*, June 1998, page 2-11
[3] Source: North Central Texas Council of Governments, *Construction and Demolition Material Recovery Facility Feasibility Study*, August 2007

materials that have existing, developed markets. Non-recoverable materials are materials that are in the C&D waste stream for which markets have not been developed. Based on the data presented in Table 7-2, approximately 83 percent of the City's C&D waste stream is estimated to be recoverable.

Table 7-2
Estimated C&D Waste Composition by Material Type

Recoverable [1]		Non-Recoverable	
Material	Percent	Material	Percent
Concrete/ Cement	15%	Drywall/ Gypsum	6%
Scrap Lumber	12%	Refuse	3%
Bricks/Cinder Blocks	12%	Other Materials	2%
Corrugated Cardboard	10%	Roofing	1%
Asphalt	9%	Tile	1%
Ferrous Metal	8%	Painted Wood	1%
Brush	5%	Wood Furniture	1%
Wood Packaging	4%	Other Glass	1%
Soil	3%	Carpet	1%
Other Paper	3%		
Non-Ferrous Metal	1%		
Yard Waste	1%		
Total Recoverable	83%	Total Non-Recoverable	17%

1. These materials represent materials that have markets and are potentially recoverable. However, whether or not these materials are actually recovered depends on the type of facility developed.

As shown in the table, there is no established market for recovered drywall. However, it is possible to use recovered drywall as a soil amendment or as an additive in compost. For the purposes of this report, R. W. Beck has assumed drywall is not a recoverable material.

7.2.3 Market Analysis

R. W. Beck made assumptions regarding the end markets for recoverable materials in the C&D waste stream. This analysis is summarized below by material category.

- **Concrete/masonry** – *Includes concrete, bricks, cinder blocks, asphalt, and other masonry*; R. W. Beck assumed that the City would make this material available to City and County street departments, private contractors, and other entities that can utilize the material. R. W. Beck did not assume any revenue would be generated from concrete or masonry material.
- **Organics** – *Includes brush, scrap lumber, wood packaging, soil, yard waste*; R. W. Beck assumed that all organics would be used as feedstock for the City's

composting operation. R. W. Beck did not assume any revenue would be generated from organic material.

- **Metals** – *Includes ferrous metal and non-ferrous metal*; R. W. Beck assumed that the City would sell this material to a recyclables broker or end user. Based on current available index pricing, R. W. Beck assumed that the City would receive $150 per ton of ferrous metal and $900 per ton of non-ferrous metal.
- **Fibers** – *Includes OCC, other paper, and office paper*; R. W. Beck assumed that the City would sell fiber material to recyclables brokers or end users. Based on projected commodities pricing summarized in Section 1.4.4, R. W. Beck assumed that the City would receive $70 per ton for OCC and $34 per ton for other paper and office paper.

7.3 Regional C&D MRF

The first option for C&D recycling facility is a large-scale, regional C&D MRF. This section summarizes R. W. Beck's planning-level estimates of the costs that would be associated with a regional C&D MRF.

7.3.1 Assumptions

Listed below are R. W. Beck's primary assumptions for this analysis.

- The MRF would recover all of the recoverable materials listed in Table 7-2.
- The MRF would be owned and operated by the City.
- The City's average cost of capital is five percent.[4] All site and building costs would be financed over a 20 year period. The useful life for processing equipment would be 10 years and useful life of rolling stock would be seven years.
- The facility would be constructed on City-owned land. Therefore, land acquisition costs were not included in this analysis.
- The City would source C&D material from surrounding communities to be processed at the facility.
- The facility would be able to capture approximately 25 percent of the C&D waste stream in Northwest Arkansas, or about 50,000 tons annually.
- For the recoverable materials in the C&D waste stream (see Table 7-2), the recovery rate would be 75 percent. Therefore, the overall diversion rate for materials entering the MRF would be approximately 62%.[5]

[4] The current economic downturn may make it difficult for the City to obtain financing for this time period at this interest rate. Upon deciding to develop a facility, the City would need to revisit this issue and confirm that they would be able to obtain these financing terms.
[5] 82% of the waste stream* 75% recovery rate = 62% diversion.

7.3.2 Capital Costs

Building and Site Construction

Without a thorough understanding of the building requirements or site location, it is challenging to develop specific cost estimates for the building and site construction of a C&D MRF. However, based on industry experience with development of similar facilities, R. W. Beck would expect that building and site development costs would be between $5 and $7 million. For the purpose of this analysis, R. W. Beck assumed building and site development costs of $6 million, or $481,456 on an amortized, annual basis.

R. W. Beck assumed for this analysis that the MRF would be constructed on City-owned land. Land acquisition costs were not included in this analysis; however, R. W. Beck would expect that the MRF would require between five and 10 acres of land.

Processing Equipment

Based on conversations with equipment manufacturers that provide equipment for C&D MRF operations, R. W. Beck estimates the total cost for processing equipment for the MRF would be $1,775,000, including delivery and installation.[6] Debt service related to the processing equipment would be $229,871 on an annual basis.

Rolling Stock

Table 7-3 provides an estimate of the cost for rolling stock needed at the site. R. W. Beck assumed a useful life for all rolling stock of seven years.

Table 7-3
Rolling Stock Costs

Description	Unit Cost	Number	Total Cost
Large Capacity Loader	$350,000	1	$350,000
Small Capacity Loader	$85,000	1	$85,000
Excavator	$175,000	1	$175,000
Forklift	$25,000	1	$25,000
Roll-off Truck	$87,500	1	$87,500
40 CY Roll-off Containers	$3,000	10	$30,000
Yard Tractor	$80,000	1	$80,000
Transfer Trailer	$65,000	1	$65,000
Sweeper	$25,000	1	$25,000
Total			$922,500
Annual Debt Service			$159,426

[6] Equipment represents $1,575,00 and delivery and installation would cost $200,000.

7.3.3 Operating Expenses

Personnel

Table 7-4 shows R. W. Beck's cost estimate for employee salaries and benefits. These personnel costs are based on actual salary and benefits information for the City's solid waste staff as well as R. W. Beck industry experience.

Table 7-4
Annual Personnel Costs

Position	Salary	Benefits	Number	Total
Site Supervisor	$45,000	$15,750	1.0	$60,750
Equipment Crew Leader	$40,972	$12,389	1.0	$53,361
Heavy Equipment Operators	$30,383	$10,649	3.0	$123,096
Mechanic	$30,383	$10,649	1.0	$41,032
Laborers	$25,000	$8,333	15.0	$500,000
Total Salary and Benefits				$778,239

Rolling Stock O&M

Table 7-5 provides estimates of the annual O&M costs for the rolling stock, including roll-off containers. O&M includes repair, routine maintenance, and fuel.

Table 7-5
Annual Rolling Stock O&M

Description	Unit O&M	Number	Total O&M
Large Capacity Loader	$70,000	1	$70,000
Small Capacity Loader	$20,000	1	$20,000
Excavator	$30,000	1	$30,000
Forklift	$5,000	1	$5,000
Roll-off Truck	$25,000	1	$25,000
40 CY Roll-off Containers	$350	10	$3,500
Yard Tractor	$20,000	1	$20,000
Transfer Trailer	$1,750	1	$1,750
Sweeper	$5,000	1	$5,000
Total Rolling Stock O&M			$180,250

Processing Equipment O&M

R. W. Beck estimates that annual O&M will be approximately four percent of the purchase price of the equipment, not including delivery and installation. Based on the

purchase price of the equipment (see Section 7.3.2), R. W. Beck estimates annual O&M cost for the processing equipment will be approximately $63,000 per year.[7]

Residual Disposal

R. W. Beck estimated that 19,135 tons of material accepted at the C&D MRF would be disposed as residual.[8] This includes both non-recoverable material and recoverable material that cannot be diverted due to inherent inefficiencies in the sorting system.[9] Based on the City's current cost of disposal of $24.47, the annual disposal cost of residual material would be $468,233.

Other Operating Costs

Table 7-6 contains estimates of additional operating expenses that need to be accounted for in the operation of a C&D MRF. These estimates are based on R. W. Beck industry experience and knowledge of similar facilities.

Table 7-6
Other Operating Expenses

Description	Cost
Utilities	$60,000
Supplies	$7,500
Training	$29,000
Building and site maintenance	$15,000
Professional Services	$60,000
Miscellaneous	$20,000
Total	$191,000

7.3.4 Commodity Revenue

Based on the market assumptions outlined in Section 7.2.3, R. W. Beck developed an estimate of the total revenue from recovered materials. R. W. Beck assumed that each recoverable material would be recovered at a rate of 75 percent.

[7] The purchase price of the processing equipment, not including delivery and installation, is estimated to be $1,575,000. $1,575,000*4% = $63,000
[8] 62%*50,000 tons = 19,135 tons
[9] Non recoverable material comprises 17% of the waste stream, and recoverable materials would be recovered at a rate of 75%.

Table 7-7
Commodity Recovery and Revenue

Material	Tonnage Total	Tonnage Revenue [1]	Tonnage Residual [2]	Revenue per ton	Total Revenue
Concrete/ Cement	7,390	5,543	1,848	$0	$0
Scrap Lumber	6,023	4,517	1,506	$0	$0
Bricks/Cinder Blocks	5,775	4,331	1,444	$0	$0
Corrugated Cardboard	4,763	3,572	1,191	$70	$250,055
Asphalt	4,379	3,285	1,095	$0	$0
Ferrous Metal	4,084	3,063	1,021	$150	$459,401
Brush	2,716	2,037	679	$0	$0
Wood Packaging	2,221	1,666	555	$0	$0
Soil	1,714	1,286	429	$0	$0
Other Paper	1,505	1,129	376	$34	$38,387
Non-Ferrous Metal	276	207	69	$900	$186,133
Yard Waste	293	220	73	$0	$0
Total	41,139	30,856	10,285	N/A	$933,976

1. Based on an average recovery rate of 75 percent, this amount of tonnage would have the potential to generate revenue.
2. Based on an average recovery rate of 75 percent, this amount of material would be disposed at the landfill.

7.3.5 Regional C&D MRF Summary

Revenue Requirement

Table 7-8 shows the revenue requirement for the regional C&D MRF. The revenue requirement represents the amount that would need to be generated from tipping fees to recover the costs of operating the facility. Revenue from the sale of recyclable commodities partially offsets the revenue requirement. As shown in the table, the processing fee required for this facility would be $32.35 per ton. This tipping fee is in line with fees charged at other C&D disposal facilities in Northwest Arkansas.

Table 7-8
Annual Revenue Requirement

Revenue Requirement	Cost
Capital Expenses	
Building and Site	$481,456
Processing Equipment	$229,871
Rolling Stock	$159,426
Subtotal	$870,753
Operating Expenses	
Personnel	$778,239
Rolling Stock O&M	$180,250
Processing Equipment O&M	$63,000
Residual Disposal	$468,233
Other Operating Expenses	$191,000
Subtotal	$1,680,722
Total Expenses	$2,551,475
Revenue from Commodities	$933,975
Revenue Requirement	$1,617,500
Tipping Fee (per ton)	$32.35

Sensitivity Analysis

R. W. Beck conducted a sensitivity analysis to determine the effect that movements in key variables would have on the required disposal fee of the regional MRF. The highlighted cell in the table represents the approximate tipping fee that results from the assumptions of the current analysis. This analysis is summarized in Table 7-9.

Table 7-9
Sensitivity Analysis of Required Processing Fee

	Tons Processed			
Revenue Per Ton	10,000	30,000	50,000	70,000
$10	$253	$78	$43	$28
$20	$243	$68	$33	$18
$30	$233	$58	$23	$8
$40	$223	$48	$13	($2)
$50	$213	$38	$3	($12)

7.4 Local C&D MRF

The second option for C&D recycling facility is a small-scale, local C&D MRF. This facility would consist of an open-air sorting line, such as the one in Figure 7-1. This section summarizes R. W. Beck's planning-level estimates of the costs that would be associated with a local C&D MRF.

Figure 7-1: Example of a C&D Sort Line (Source: Krause Manufacturing)

7.4.1 Assumptions

Following are R. W. Beck's assumptions for this analysis.

- R. W. Beck estimated that the City hauls between 4,000 and 6,000 tons of C&D annually (see Section 7.2.1). For the purposes of this analysis, R. W. Beck assumed that 5,000 tons of material would be processed at this facility.
- At this facility, mixed C&D material would be loaded onto the conveyor and sorted into six different roll-off containers by the following material types:
  - Concrete/cement
  - Ferrous metal
  - Non-ferrous metal
  - Compostable material (e.g., scrap lumber, brush)
  - OCC
  - Other paper (e.g., office paper, other paper)
- Bricks/cinder blocks and asphalt would not be recovered at this facility. Therefore, the 62 percent of the total C&D waste stream would be recoverable at this facility.[10]

[10] Based on the information in Table 7-2, 83% (recoverable materials) minus 12% (bricks and cinder blocks) minus 9% (asphalt) equals 62%.

- The City's average cost of capital is five percent. R. W. Beck assumed all site costs would be financed over a 20 year period. R. W. Beck assumed a useful life for processing equipment of 10 years and useful life of rolling stock of seven years
- The facility would be constructed on City-owned land. Therefore, R. W. Beck did not include land acquisition costs in the cost estimates for the MRF.
- The facility would be located at or near the transfer station and would utilize the existing infrastructure (e.g. utilities, scale house).[11]
- For those materials targeted for recovery, the recovery rate would be 65 percent. Therefore, the overall diversion rate for the facility would be 40 percent.

7.4.2 Capital Costs

Facility and Site Development

The primary needs for the local MRF would be a concrete pad and development of the site. R. W. Beck would expect that the concrete pad for the sort line would need to be approximately 1/10 of one acre. To be conservative, R. W. Beck assumed that the sort line itself would be the only piece of equipment on the concrete pad.[12] This pad would be large enough for the sort line itself. Based on recent concrete construction costs provided by the City, the concrete pad would cost approximately $15,000. The estimated costs for the concrete pad and site development are shown in Table 7-10.

Table 7-10
Facility and Site Development Costs

Description	Cost
Concrete pad	$15,000
Site development	$15,000
Total	$30,000
Annual Debt Service	$2,407

Processing Equipment

The primary processing equipment used at the site would be a sort line with a conveyor and sorting stations, an example of which is shown in Figure 7-1. R. W. Beck estimates that the purchase price for the sort line would be approximately $190,000, including delivery and installation. The amortized cost of the processing equipment would be $24,606 on an annual basis.

[11] R. W. Beck understands that there are some space limitations at the current transfer station site. However, R. W. Beck used the simplifying assumption that the site would be located at or near the transfer station for the purposes of this planning-level analysis.
[12] Other activities associated with the operation could be conducted on gravel or crushed aggregate.

Rolling Stock

Table 7-11 provides an estimate of the cost for rolling stock needed at the site. R. W. Beck assumed a useful life for all rolling stock of seven years.

Table 7-11
Rolling Stock Costs

Description	Unit Cost	Number	Total Cost
Small Capacity Loader	$65,000	1	$65,000
Excavator	$175,000	1	$175,000
40 CY Roll-off Containers	$3,000	12	$36,000
Total			$276,000
Annual Debt Service			$47,698

7.4.3 Operating Expenses

Personnel

Table 7-12 shows R. W. Beck's cost estimate for employee salaries and benefits. R. W. Beck assumed that the City would employ eight pick-line laborers at the site. Four materials would have one laborer and two materials would have two laborers.

Table 7-12
Annual Personnel Costs

Position	Salary	Benefits	Number	Total
Equipment Crew Leader	$40,972	$12,389	1.0	$53,361
Heavy Equipment Operators	$30,383	$10,649	1.0	$41,032
Laborers	$25,000	$8,333	8	$266,664
Total Salary and Benefits				$361,057

Equipment O&M

Table 7-13 summarizes the O&M costs associated with the rolling stock and processing equipment for the local C&D MRF. Rolling stock costs include repair, routine maintenance, and fuel.

Table 7-13
Annual Equipment O&M

Description	Unit O&M	Number	Total O&M
Processing Equipment (sort line)	$6,000	1	$6,000
Small Capacity Loader	$12,500	1	$12,500
Excavator	$20,000	1	$20,000
Roll-off Containers	$350	6	$2,100
Total Equipment O&M			$40,600

Residual Disposal

R. W. Beck estimated that 2,986 tons of material accepted at the C&D MRF would be disposed as residual.[13] This includes both non-recoverable material and recoverable material that cannot be diverted due to inherent inefficiencies in the sorting system.[14] Based on the City's current cost of disposal of $24.47, the annual disposal cost of residual material would be $73,068.

Other Operating Costs

Table 7-14 contains estimates of additional operating expenses that need to be accounted for in the operation of a local C&D MRF. These estimates are based on R. W. Beck industry experience and knowledge of similar facilities.

Table 7-14
Other Operating Expenses

Description	Cost
Utilities	$15,000
Supplies	$7,500
Training	$14,000
Site maintenance	$2,500
Miscellaneous	$7,500
Total	$46,500

7.4.4 Commodity Revenue

Based on the market assumptions outlined in Section 7.2.3, R. W. Beck developed an estimate of the total revenue from recovered materials. R. W. Beck assumed that each material targeted for recovery would be recovered at a rate of 65 percent.

[13] Assuming an overall diversion rate of 40% (see Section 7.4.1), approximately 60% of material would be disposed.
[14] R. W. Beck assumed a recovery rate of 65% for this material.

Table 7-15
Commodity Recovery and Revenue

Material	Tonnage Total	Tonnage Revenue [1]	Tonnage Residual [2]	Revenue per ton	Total Revenue
Concrete/ Cement	739	480	259	$0.00	$0
Scrap Lumber	602	391	211	$0.00	$0
Bricks/Cinder Blocks [3]	577	0	577	$0.00	$0
Corrugated Cardboard	476	310	167	$70.00	$21,671
Asphalt [4]	438	0	438	$0.00	$0
Ferrous Metal	408	265	143	$150.00	$39,815
Brush	272	177	95	$0.00	$0
Wood Packaging	222	144	78	$0.00	$0
Soil	171	111	60	$0.00	$0
Other Paper	151	98	53	$34.00	$3,327
Non-Ferrous Metal	28	18	10	$900.00	$16,131
Yard Waste	29	19	10	$0.00	$0
Total	4,113	2,013	2,100	N/A	$80,944

1. Based on an average recovery rate of 65 percent, this amount of tonnage would have the potential to generate revenue.
2. Based on an average recovery rate of 65 percent, this amount of material would be disposed at the landfill.
3. Bricks and cinder blocks would not be recovered.
4. Asphalt would not be recovered.

7.4.5 Summary of Local C&D MRF

Revenue Requirement

Table 7-16 shows the revenue requirement for the local C&D MRF operation. The revenue requirement represents the amount that would need to be generated from tipping fees to recover the cost of operating the facility. Revenue from the sale of recyclable commodities partially offsets the revenue requirement. As shown in the table, the processing fee required for this facility would be $102.38 per ton, which is significantly higher than disposal alternatives in the region.

Table 7-16
Annual Revenue Requirement

Revenue Requirement	Cost
Capital Expenses	
Building and Site	$2,407
Processing Equipment	$24,606
Rolling Stock	$47,698
Subtotal	$74,711
Operating Expenses	
Personnel	$361,057
Equipment O&M	$42,700
Residual Disposal	$73,068
Other Operating Expenses	$46,500
Subtotal	$521,225
Total Expenses	$598,036
Revenue from Commodities	$80,944
Revenue Requirement	$517,092
Tipping Fee (per ton)	$103.42

Sensitivity Analysis

R. W. Beck conducted a sensitivity analysis to measure the relative impacts of key variables on the resulting tipping fee for the facility. The highlighted cell in the table represents the approximate tipping fee that results from the assumptions of the current analysis. This analysis is summarized in Table 7-17.

Table 7-17
Sensitivity Analysis of Required Processing Fee

	Tons Processed			
Revenue Per Ton	2,500	5,000	7,500	10,000
$10	$218	$111	$76	$58
$20	$208	$101	$66	$48
$30	$198	$91	$56	$38
$40	$188	$81	$46	$28
$50	$178	$71	$36	$18

7.5 Manual Sorting

The third option for a C&D recycling facility would be a manual sorting area at the City's transfer station. A manual sorting area would consist of an open space for trucks to unload material. Laborers would sort recyclables into roll-off containers, and the residuals would be reloaded into a roll-off container for disposal. See Figure 7-2 for an example of a manual sorting facility for C&D materials.

Figure 7-2: Example of C&D Manual Sorting Area

Whereas the regional C&D MRF option represents what the City could do with a large investment and level of effort, this option represents a C&D recycling facility that would require minimal investment and resources. This section summarizes R. W. Beck's planning-level estimates of the costs that would be associated with a manual sorting area at the transfer station.

7.5.1 Assumptions

- 5,000 tons of material would be processed at this facility (see Section 7.4.1).
- At this facility, mixed C&D material would be sorted into six different roll-off containers by the following material types:
  - Concrete/cement
  - Ferrous metal
  - Non-ferrous metal
  - Compostable material (e.g., scrap lumber, brush)
  - OCC
  - Other paper (e.g., office paper, other paper)

- Bricks/cinder blocks and asphalt would not be recovered at this facility. Therefore, the 62 percent of the total C&D waste stream would be recoverable at this facility.[15]
- The City's average cost of capital is five percent.
- R. W. Beck assumed a useful life of rolling stock of seven years.
- The facility would be located at the transfer station and would utilize the existing infrastructure (e.g. utilities, scale house).
- For those materials targeted for recovery, the recovery rate would be 50 percent. Therefore, the overall diversion rate for the facility would be 31 percent.

7.5.2 Capital Costs

Table 7-18 provides an estimate of the cost for rolling stock needed at the site. R. W. Beck assumed a useful life for all rolling stock of seven years.

Table 7-18
Rolling Stock Costs

Description	Unit Cost	Number	Total Cost
Small Capacity Loader	$65,000	1	$65,000
40 CY Roll-off Containers	$3,000	6	$18,000
Total			$83,000
Annual Debt Service			$14,344

It could potentially be beneficial for the City to pave the manual sorting area. However, the purpose of this analysis is to demonstrate what the City could develop with minimal investment. Therefore, R. W. Beck did not include costs for a paved sorting area in this analysis.

7.5.3 Operating Expenses

Personnel

Table 7-19 shows R. W. Beck's cost estimate for employee salaries and benefits for the local C&D MRF. R. W. Beck assumed that the City would employ three laborers to manually sort material and one equipment operator to operate the loader.

[15] Based on the information in Table 7-2, 83% (recoverable materials) minus 12% (bricks and cinder blocks) minus 9% (asphalt) equals 62%.

Table 7-19
Annual Personnel Costs

Position	Salary	Benefits	Number	Total
Heavy Equipment Operators	$30,383	$10,649	$41,032	$41,032
Laborers	$25,000	$8,333	3	$100,000
Total Salary and Benefits				$141,032

Rolling Stock O&M

Table 7-20 summarizes the O&M costs associated with the rolling stock for the site.

Table 7-20
Annual Equipment O&M

Description	Unit O&M	Number	Total O&M
Small capacity loader	$12,500	1	$12,500
Roll off containers	$350	6	$2,100
Total Equipment O&M			$14,600

Residual Disposal

R. W. Beck estimated that 3,450 tons of material accepted at the facility would be disposed as residual.[16] Based on the City's current cost of disposal of $24.47, the annual disposal cost of residual material would be $84,412.

Other Operating Costs

For this option, R. W. Beck included $12,500 for miscellaneous supplies.

7.5.4 Commodity Revenue

R. W. Beck developed an estimate of the total revenue from recovered materials. R. W. Beck assumed that each material targeted for recovery would be recovered at a rate of 50 percent.

[16] Assuming an overall diversion rate of 31% (see Section 7.4.1), approximately 71% of material would be disposed.

Table 7-21
Commodity Recovery and Revenue

Material	Tonnage Total	Tonnage Revenue [1]	Tonnage Residual [2]	Revenue per ton	Total Revenue
Concrete/ Cement	739	370	370	$0.00	$0
Scrap Lumber	602	301	301	$0.00	$0
Bricks/Cinder Blocks [3]	577	0	577	$0.00	$0
Corrugated Cardboard	476	238	238	$70.00	$16,670
Asphalt [4]	438	0	438	$0.00	$0
Ferrous Metal	408	204	204	$150.00	$30,627
Brush	272	136	136	$0.00	$0
Wood Packaging	222	111	111	$0.00	$0
Soil	171	86	86	$0.00	$0
Other Paper	151	75	75	$34.00	$2,559
Non-Ferrous Metal	28	14	14	$900.00	$12,409
Yard Waste	29	15	15	$0.00	$0
Total	4,113	1,550	2,565	N/A	$62,265

1. Based on an average recovery rate of 50 percent, this amount of tonnage would have the potential to generate revenue.
2. Based on an average recovery rate of 50 percent, this amount of material would be disposed at the landfill.
3. Bricks and cinder blocks would not be recovered.
4. Asphalt would not be recovered.

7.5.5 Summary of Manual Separation

Revenue Requirement

Table 7-22 shows the revenue requirement for the manual sorting facility. The revenue requirement represents the amount that would need to be generated from tipping fees to recover the cost of operating the facility. Revenue from the sale of recyclable commodities partially offsets the revenue requirement. As shown in the table, the processing fee required for this facility would be $40.92

Table 7-22
Annual Revenue Requirement

Revenue Requirement	Cost
Capital Expenses	
Rolling Stock	$14,344
Operating Expenses	
Personnel	$141,032
Equipment O&M	$14,600
Residual Disposal	$84,412
Other Operating Expenses	$12,500
Subtotal	$252,544
Total Expenses	$266,888
Revenue from Commodities	$62,265
Revenue Requirement	$204,623
Tipping Fee (per ton)	$40.92

Sensitivity Analysis

R. W. Beck conducted a sensitivity analysis to measure the relative impacts of key variables on the resulting tipping fee for the facility. The highlighted cell in the table represents the approximate tipping fee that results from current assumptions.

Table 7-23
Sensitivity Analysis of Required Processing Fee

	Tons Processed			
Revenue Per Ton	2,500	5,000	7,500	10,000
$10	$80	$43	$31	$25
$20	$70	$33	$21	$15
$30	$60	$23	$11	$5
$40	$50	$13	$1	($5)
$50	$40	$3	($9)	($15)

7.6 Impact of Population Growth

R. W. Beck recognizes that population and C&D waste stream growth over time will impact the financial feasibility of the C&D recycling facility options. Therefore, R. W. Beck conducted an analysis of the impact of population growth on the resulting tipping fee for the local and manual sorting facilities. R. W. Beck used the C&D

waste stream projections in Section 1.4.2, as well as the sensitivity analyses in this section, for this analysis.

Since R. W. Beck did not develop waste generation estimates for the region as a whole, the regional C&D MRF option is not included in this analysis. However, R. W. Beck would expect that, as the region grows, a regional C&D MRF will become more financially feasible. In addition, as the region grows, the City would need to capture a lower percent of the market to generate enough material to make a facility financially viable.

Table 7-24
Impact of Population Growth on C&D Recycling Feasibility

Revenue Per Ton	2013	2018	2028
Roll-Off Tons	11,253	12,507	15,224
Estimated C&D Tons [1]	5,626	6,254	7,612
Required Tip Fee [2]			
Local MRF	$101	$101 –$66	$66
Manual Separation	$33	$33—$21	$21

1. Assumes C&D material makes up approximately 50% of roll-off tons.
2. Assumes commodity revenue of $20 per ton.

7.7 Key Findings and Recommendations

1. **The quantity of C&D material being generated in the City and in Northwest Arkansas is unknown.** R. W. Beck estimates that between 4,000 and 6,000 tons of C&D material are hauled and disposed by City collection crews on an annual basis.
2. **The feasibility of a large-scale, regional C&D MRF is largely dependent on the amount material the City is able to source from the region.** For instance, if the City is able to source more than 50,000 tons of material – at current commodity prices – the facility disposal fee is competitive with other disposal options in the region. However, based on the sensitivity analysis, if the City only sources 10,000 or 30,000 tons of material, the tipping fee would be significantly higher than other disposal options for C&D material. Therefore, R. W. Beck would recommend that the City consider a large-scale, regional MRF as a long term option.
3. **Since the City controls a small portion of the regional C&D waste stream, there is risk associated with developing a large-scale facility.** According to R. W. Beck's estimates, the City controls approximately 2.5 percent of the regional C&D waste stream. Therefore, if the City were to develop a facility, it could potentially be challenging to source material from private haulers and other municipalities.

4. **A small-scale, local MRF is financially infeasible given the City's current tonnage level.** Even considering higher commodity values, as shown in the sensitivity analysis, the required tipping fee for this facility is substantially greater than existing disposal options in the City.

5. **A manual sorting facility at the City's transfer station is a potentially feasible option.** If the City were to increase C&D tonnage to 7,500 tons, the tipping fee for the facility would be more comparable to the current cost of disposal of $24.47. If the City were to increase C&D tonnage to 10,000 tons, the tipping fee for the facility would be less than the cost of disposal.

Section 8
Emerging Technologies Analysis

8.1 Overview

R. W. Beck conducted a planning level evaluation of new systems or technologies that could refine, modify, or completely change the City's current recycling system or the entire waste management program. Based on direction from City staff, R. W. Beck evaluated the organic waste treatment unit proposed by the French company Oxalor. This analysis was developed on a planning level basis, and as such, it provides the City with a high-level of understanding of the key elements of the technology as well as the costs associated with utilizing the technology. R. W. Beck also conducted a limited internet, literature and industry search to identify any other companies that are utilizing the Oxalor technology.

R. W. Beck's assessment of the Oxalor process included the following:

- Materials flow
- Waste diversion potential
- Pilot summary
- Commercial operating status
- Risks
- Cost

R. W. Beck's key findings and recommendations regarding the Oxalor technology are included at the end of this section.

8.2 Materials Flow

The Oxalor technology is a controlled mechanical, chemical and physical process for the management of municipal solid waste (MSW). The initial phase of the Oxalor process begins with the treatment of MSW with a chemical reagent, a mixture that consists mostly of lime. The exposure to the reagent subjects the MSW to an exothermic reaction that causes the break down and separation of organic material (e.g., paper, yard waste, food waste) from the inorganic (e.g., metals, plastic, glass). The heat generated from this reaction dehydrates and sanitizes the organic material.

After the initial phase of treatment, the commingled material is subjected to a complex sorting process that separates organic material from the inorganic. Upon completion of the initial sorting process, the organic by-product is stored for later agricultural use and the inorganic is further sorted to extract potentially recyclable material from the

remaining material that will be disposed as residuals. The process produces the following materials:

- The organic by-product called Oxycom that can be used as an agricultural soil-conditioner
- Sorted material – primarily metals and plastics – that can be recovered and sold
- Residual material that must be disposed

Figure 8-1 is a detailed illustration of the Oxalor process. Figure 8-2 is a conceptual diagram of the Oxalor treatment process.

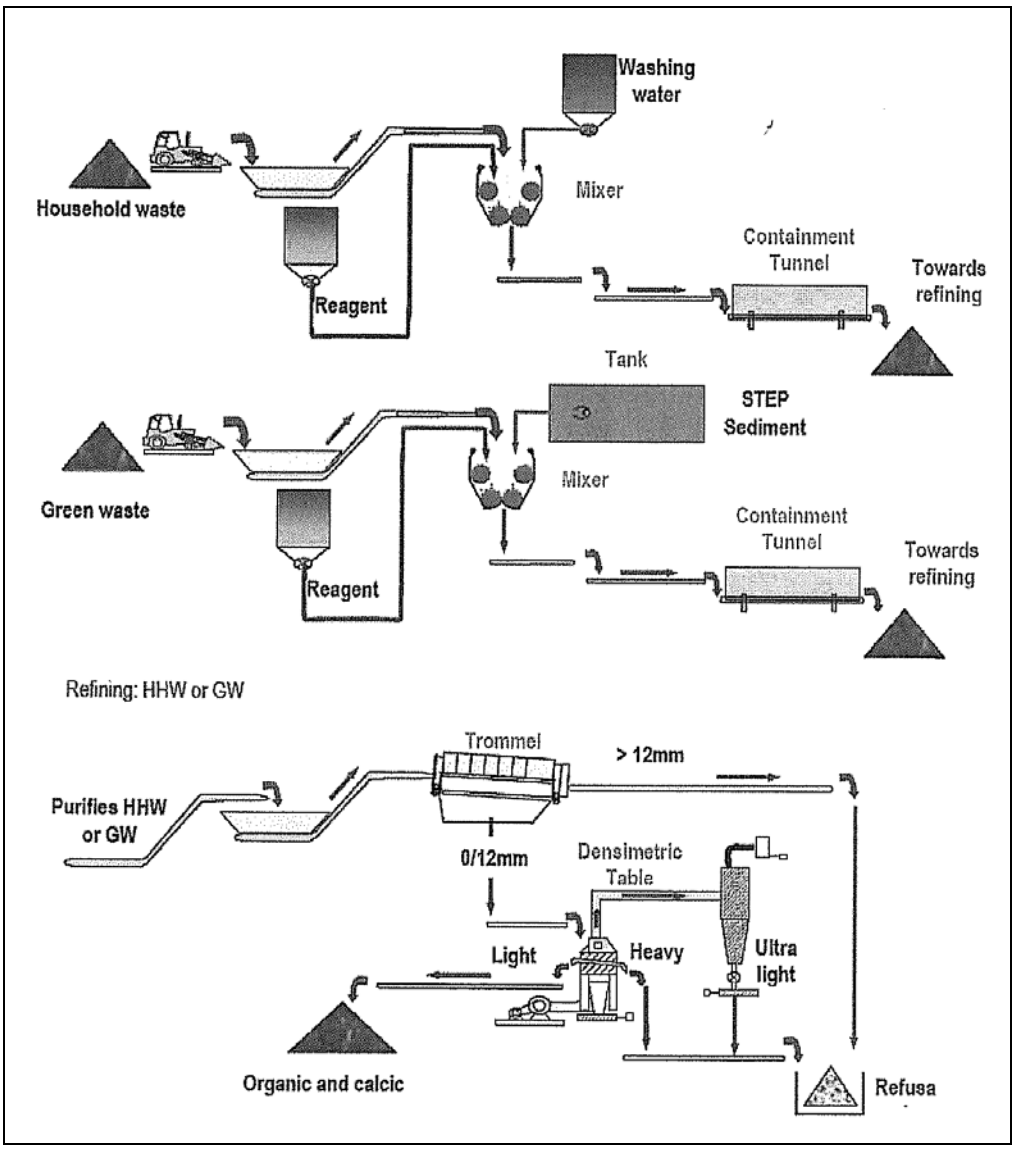

Figure 8-1: Oxalor MSW Treatment Process
Source: Oxalor

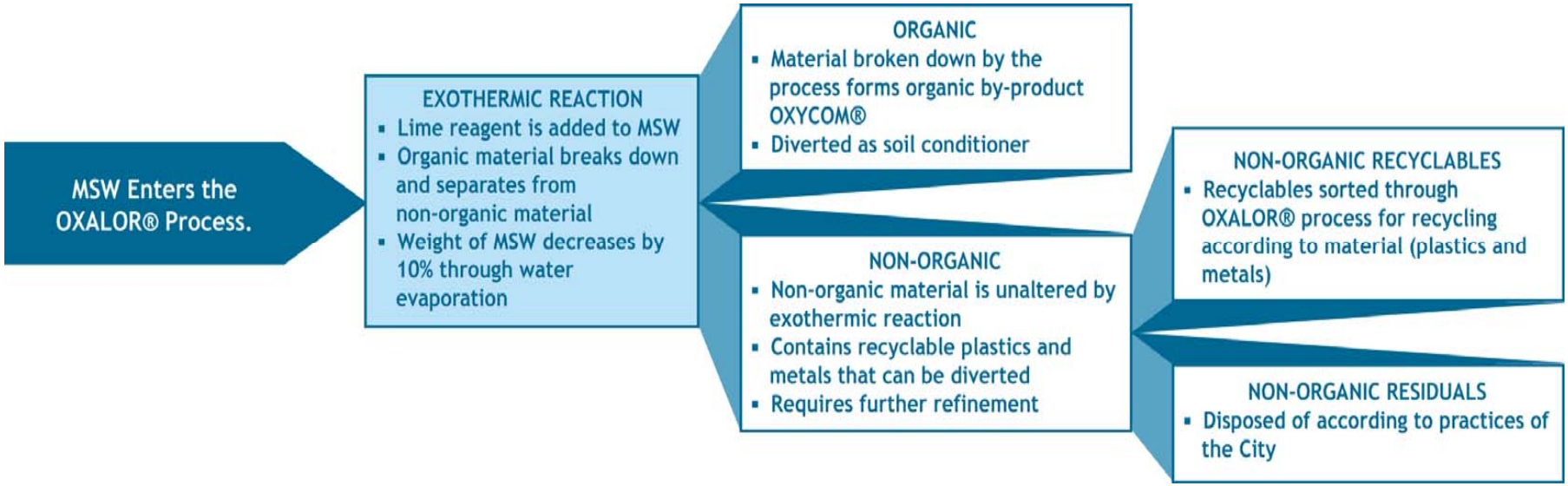

Figure 8-2: Oxalor Treatment Process Diagram

8.3 Waste Diversion Potential

In this section R. W. Beck provided discussion regarding diversion potential of using the Oxalor process. In conducting this analysis, R. W. Beck assumed that the City would discontinue its current recycling programs (e.g., curb-sort, composting, commercial OCC) and treat the entire City waste stream with the Oxalor system.

The achievable level of waste diversion for the Oxalor process depends largely on the composition of the waste stream that is processed. There is no waste characterization data available for the City's waste stream or for the State of Arkansas. However, Table 8-1 shows an estimated composition of the City's waste stream using waste characterization data provided by the U.S. Environmental Protection Agency (EPA). The total material processed by the Oxalor system would be 65,331 tons.[1] However, based on information provided by Oxalor, the gross weight of the MSW entering the process will be reduced by 10 percent due to water evaporation. Therefore, net weight of the material to be sorted by the system would be 58,798 tons. Table 8-1 also illustrates the expected recovery rate of each material in the waste stream, based on data provided by Oxalor.

Table 8-1
Projected Fayetteville Material Recovery with Oxalor System

Material	Waste Composition		Tons After Weight Reduction	Recovery Rate	Recovered Tonnage	Residual Tonnage
	% of Total [1]	Tons				
Paper / OCC	34%	22,213	19,991	85%	16,993	2,999
Organics	31%	20,253	18,227	85%	15,493	2,734
Glass	5%	3,267	2,940	0%	0	2,940
Plastics	12%	7,840	7,056	65%	4,586	2,470
Textiles	7%	4,573	4,116	0%	0	4,116
Metals	8%	5,227	4,704	50%	2,352	2,352
Other	3%	1,960	1,764	0%	0	1,764
Total	100%	65,331	58,798	N/A	39,424	19,375

1. Source: *Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2006*, U.S. Environmental Protection Agency

Based on information provided by Oxalor, the primary materials that can be recovered and diverted with the Oxalor process are organic materials (including paper), plastics, and metals. Based on data shown in Table 8-1, the City's maximum achievable

[1] This tonnage is based on the material that is currently collected in the following programs: residential curbside and drop-off recycling, residential refuse, composting, commercial OCC, commercial front-load refuse, and commercial roll-off refuse.

diversion rate using the Oxalor system would be approximately 70 percent.[2] This projected diversion is based on the assumption that the City's waste stream has not been subjected to any recycling methods prior to treatment; or, in other words, the waste stream contains materials that would normally have been diverted with the City's current recycling programs. R. W. Beck would emphasize that 70 percent would be the maximum achievable diversion rate for the Oxalor system and not necessarily the actual diversion rate. This is because it is possible that not all recovered material will actually be recycled. For instance, when commingled plastics are sold to a recycler, it is possible that they would pull out the most valuable plastics (such as #1 and #2 bottles) and dispose of the remaining material.

8.4 Pilot Summary

This section contains a detailed summary of the only official performance analysis conducted on the Oxalor process. The analysis was performed by the French Ministry of the Environment and Energy Control (ADEME) in 2004. The ADEME studied the performance of Oxalor's first pilot program located in St. Denis de Pile, France. The pilot program took place during two consecutive six month trial periods (July 2001-December 2001 and January 2002-June 2002) at a low capacity level. The following pilot data was provided:

- 4,413 tons of MSW were treated from July 2001 to December 2001.
- 2,966 tons of MSW were treated from January 2002 to June 2002.
- 2,812 tons of Oxycom was produced during the first trial period, accounting for 64 percent of the weight of treated MSW. 2,320 tons was produced in the second trial period, accounting for 78 percent of the weight of treated MSW.
- Approximately 19 percent of the weight of treated MSW was lost through water evaporation during the process in the first trial period. In the second trial period approximately 26 percent of the weight of treated MSW was lost through water evaporation.

Based on this information, the Oxalor system processed approximately 7,379 tons during the two six month trial periods. This is significantly lower than the amount of material that the City would need to process using the Oxalor system. Representatives from Oxalor claim that the process can treat as much as 110,000 tons of MSW per year when operating at full capacity. However, since all of the operational facilities are still operating on a pilot basis, there have not been any examples of systems that have processed this quantity of material.

[2] R. W. Beck calculated the estimated diversion rate of 70 percent by adding the amount of weight reduced from the exothermic reaction (6,533 tons) and the weight of recovered materials (39,424 tons). This amount (45,957 tons) was divided by the gross tonnage entering the process (65,331 tons).

8.5 Commercial Operating Status

There are a limited number of entities that are currently using the Oxalor technology to process MSW. On a commercial level, R. W. Beck identified two entities located in Europe that currently utilize the Oxalor process. Based on information provided by Oxalor representatives, the Oxalor process is not currently being used within the United States.

- **Lezay, France** operates a small plant that was initially the second pilot program for Oxalor. The plant was the first attempt by Oxalor to treat MSW for a consecutive year through an experimental permit issued by the French government. The experimental period has since passed and Lezay currently uses the Oxalor process to treat sludge only, not MSW.
- **Itradec** is an organic waste processing company located in Mons, Belgium. Itradec constructed a facility to utilize the Oxalor process conjointly with their technology that generates biogas. Operation of this facility began on July 1, 2008. Twenty days later, a fire – unrelated to the Oxalor process – badly damaged the facility. Itradec is currently working with Oxalor to rebuild the plant and plans to resume operations in January 2009.

8.6 Risks

R. W. Beck reviewed the Oxalor process to identify key technical, environmental, and economic risks associated with the technology. In identifying risks, R. W. Beck referenced information contained in the ADEME review of the pilot program in St. Denis de Pile (see Section 8.4).

Technical

- R. W. Beck has identified two facilities that are utilizing the Oxalor system. The lack of commercialization of the system results in a limited amount of data and research surrounding the technology.
- The performance of the Oxalor technology over a long-term period is unknown. Oxalor representatives estimate that the technology has a productive lifespan of 20 years; however, there are no existing facilities that have been operating for this amount of time.
- There are significant risks associated with the scale-up process from pilot program status to a full-scale commercial operation. Without a full-scale reference facility, the effectiveness and performance of a commercially operating facility is largely unknown.

Environmental

- ADEME concluded that the lime-based Oxycom had lime contents that were too high for agricultural use. Oxalor has since reported that the lime content of Oxycom has been decreased.

- The quality of MSW entering the Oxalor process affects the quality of the organic by-product Oxycom. Therefore, should the treated MSW contain any harmful material, this material could contaminate the soil amendment that is produced. Specifically, the ADEME noted a potential environmental risk of heavy metal contamination.
- The long-term environmental impact of the by-product Oxycom is unknown has not been specifically studied. Oxycom would require further evaluation to determine if it would be suitable for agricultural use in Northwest Arkansas.

Economic

- Without a full-scale reference facility, it is difficult to project operating costs for the system. In addition, without a reference facility, R. W. Beck must rely on data provided by the vendor to project the capital and operating costs for the system. Because of these factors, it is possible that estimated operating costs will be understated.
- It is unknown whether a market for Oxycom exists in Northwest Arkansas, or anywhere in the United States. If the Oxalor process was implemented, the City would have to develop a market for this product.

8.7 Cost

Overview

R. W. Beck developed planning-level estimates of the capital and operating costs for the City to operate the Oxalor processing system. **R. W. Beck emphasizes that there is no full-scale, operational facility that can serve as a reference point for operating costs. Because of this, R. W. Beck has relied on information provided by the vendor to develop these cost estimates. Due to these factors, this analysis will have a larger margin of error than is typical for other planning-level cost estimates. In addition, R. W. Beck has included contingency costs in some portions of the analysis in an effort to make these cost estimates conservative.**

Capital Costs

R. W. Beck obtained capital cost information from Oxalor for the capital and equipment associated with the Oxalor processing system.[3] Based on cost information provided by Oxalor, a facility to process approximately 65,000 tons per year would require $10.8 million in capital and equipment. In addition, R. W. Beck developed cost estimates for a facility to house the Oxalor system. The building would need to be approximately 40,000 square feet. Without a complete understanding of the facility requirements, it is challenging to develop specific cost estimates for a building. However, based on industry experience with development of similar facilities, R. W. Beck would expect that the cost the building would be between $3 and $5

[3] Cost estimates were originally provided in Euros. R. W. Beck converted all costs to U.S. Dollars using the October 2008 exchange rate of 1 Euro = 1.35913 U. S. Dollars.

million. For the purpose of this analysis, R. W. Beck assumed a building cost of $4 million and that the facility would be built on City-owned land; therefore land acquisition costs were not included in this analysis. R. W. Beck amortized the capital costs over 20 years at a five percent interest rate.[4] R. W. Beck also included a contingency of 20 percent of the total capital cost of the system in order to make the analysis more conservative. Table 8-2 shows the projected capital costs for an Oxalor facility.

Table 8-2
Projected Capital Costs

Capital Item	Total Cost	Amortized Cost
Oxalor Equipment	$10,800,000	$866,620
Building Costs	$4,000,000	$320,970
Wheel Loader	$85,000	$14,690
"Soft" Costs [1]	$2,220,000	$178,139
Total	$17,105,000	$1,380,419
Plus: Contingency (20%)	$3,421,000	$274,510
Total Estimated Capital Costs	$20,526,000	$1,654,928

1. Accounts for the financial, legal and environmental compliance and permitting costs associated with the development of this project. Represents 15% of the cost of the equipment and building.

Labor

With input from Oxalor representatives, R. W. Beck developed personnel cost estimates for the City to operate the Oxalor system. The system would need to operate five days per week for two, six-hour shifts each day, resulting in a 60-hour work week.[5] One supervisor and two equipment operators would need to be on-site during operating hours. Therefore, 1.5 FTE supervisors and three FTE equipment operators would be needed to operate the Oxalor system. In addition, R. W. Beck included an additional FTE employee to maintain the system as well as serve as backup personnel.

[4] The current economic downturn may make it difficult for the City to obtain financing for this time period at this interest rate. Upon deciding to implement the Oxalor system, the City would need to revisit this issue and confirm that they would be able to obtain these financing terms.
[5] Oxalor representatives stated that facility is most effectively operated on two, six-hour shifts.

Table 8-3
Projected Personnel Costs

Position	FTEs	Annual Salary (ea)	Annual Benefits (ea)	Total Salary and Benefits (ea)
Supervisor [1]	1.5	$40,972	$12,389	$53,561
Equipment Operator [2]	3.0	$30,383	$10,649	$41,032
Maintenance/Backup Personnel [3]	1.0	$30,383	$10,649	$41,032

1. Salary and benefits estimates based on average actual salaries for City crew leaders.
2. Salary and benefits estimates based on average actual salaries for the City's MRF operators.
3. Salary and benefits estimates based on average actual salaries for the City's MRF operators.

Materials and Supplies

The signature component of the Oxalor process is the exothermic reaction that breaks down the organic material and separates it from the non-organic material. In order for this exothermic reaction to occur, one ton of lime is needed for every gross 10 tons of MSW entering the system. Based on information from Oxalor, the current price of lime is $135 per ton. However, in order to make these cost estimates more conservative, R. W. Beck has assumed a unit price of $155, which represents a 15 percent contingency.

Other Operating and Maintenance Expenses

Table 8-4 provides representative operating and maintenance (O&M) costs for an Oxalor facility. Based on information provided by Oxalor, annual equipment maintenance costs are approximately two percent of the cost of the system. However, based on industry experience, R. W. Beck expects five percent of the cost of the system is a more realistic approximation. R. W. Beck would note that the cost estimate provided for utilities is based on industry experience with solid waste facilities, such as MRFs, of similar size and scale. Oxalor was unable to provide any data as to actual energy and water consumption for the Oxalor system. Therefore, this estimate has a large margin of error and is likely understated.

Table 8-4
Projected O&M Expenses

Cost Item	Annual Cost	Basis
Maintenance and Repair		
Oxalor Equipment	$540,000	5% of system value, annually
Rolling Stock	$20,000	Includes fuel, maintenance, and repair
Utilities	$30,000	Benchmarking similar solid waste facilities
Total	$590,000	

Disposal Costs for Residuals

The City would also incur costs associated with the disposal of residual material from the Oxalor process. Approximately 19,375 tons of waste would need to be disposed as residual material on an annual basis (see Table 8-1). At the City's current disposal rate of $24.47 per ton, the annual disposal cost would be $474,106.

Revenue from Recovered Materials

The Oxalor process would produce several materials that could potentially be recovered and marketed, including:

- Oxycom soil amendment
- Commingled metals
- Commingled plastics

There are several factors that make it challenging to project the revenue that could be generated from these commodities. First, the quality of the recovered material is unknown. The Oxalor process could produce commodities that are much more contaminated than traditional recyclables. Second, there is not an established domestic market for materials recovered through the Oxalor system. Because of these factors, R. W. Beck has developed relatively conservative assumptions regarding the revenue that could be generated from recovered materials.

The soil amendment Oxycom would potentially generate revenue for the City. However, it is unknown whether this particular soil amendment would be suitable for agricultural use in Northwest Arkansas. Additionally, the City would need to develop a specific market for this product before it would generate revenue. Because of this, R. W. Beck has not included revenue from the sale of Oxycom in this cost estimate.

The City could also potentially generate revenue from the sale of commingled plastics and commingled metals. Based on industry experience, R. W. Beck is familiar with prices that are typically received for commingled commodities. However, R. W. Beck assumed a significant discount to these market prices based on the unknown quality of the recovered material. For commingled plastics generated from traditional recycling programs, R. W. Beck would expect that the City would receive approximately $0.08 per pound, or $160 per ton. For commingled metals recovered via more traditional methods, R. W. Beck would expect that the City could receive $0.05 per pound or approximately $100 per ton. R. W. Beck applied a 50 percent discount to these prices based on the unknown quality of the material.

Table 8-5
Estimated Revenue from Recovered Materials

Material	Tons	Revenue/Ton	Total Revenue
Oxycom	32,486	$0	$0
Commingled Metals	2,352	$50	$117,600
Commingled Plastics	4,586	$80	$366,880
Total	39,424	N/A	$483,480

Cost Summary

Table 8-6 summarizes the cost projections for the City to operate the Oxalor system.

Table 8-6
Total Oxalor Processing Costs

Description	Amount
Capital	$1,654,928
Labor	$244,170
Materials and Supplies	$1,012,631
Other Operating Costs	$590,000
Disposal Cost	$474,106
Revenue from Recovered Materials	-$484,480
Total Cost	$3,491,355
Cost Per ton	*$53*

Comparison to Current Solid Waste System

Table 8-7 summarizes the costs associated with the City's current solid waste system. The per-ton figures in the table were developed based on budget information provided by the City. As shown in the Table, the cost the City to manage the MSW generated from these programs is approximately $6.1 million per year.

Table 8-7
Status Quo System

Program	Collection (per ton)	Processing/ Disposal (per ton)	Total Cost (per ton)	Total Tons	Annual Cost
Residential					
Refuse	$83	$24	$107	12,870	$1,383,139
Recycling	$193	($47)	$146	5,523	$806,358
Composting	N/A	N/A	$139	5,127	$714,704
Drop-off	$0	($29)	($29)	1,113	($32,277)
Subtotal				24,633	$2,871,924
Commercial					
OCC	$54	($19)	$35	928	$32,480
Refuse	$54	$24	$78	30,066	$2,359,279
Roll Off	$62	$24	$86	9,704	$839,105
Subtotal				40,698	$3,230,864
TOTAL				65,331	$6,102,788

Table 8-8 summarizes the collection and processing costs that the City would incur if they utilized the Oxalor technology. To develop this analysis, R. W. Beck assumed that the City would collect all residentially generated MSW through the current refuse program. In other words, the City would discontinue its composting and recycling programs for residents and treat all MSW as refuse. In addition, R. W. Beck assumed that the commercial OCC collection program would be discontinued and that all commercial MSW would be collected as refuse in front-load containers or in roll-offs.

As shown in the table, the cost to the City to manage MSW with the Oxalor process would be approximately $7.7 million, a 28 percent cost increase over the current system. The cost savings incurred by discontinuing the recycling and composting programs were not enough to offset the cost increase from using the Oxalor system to process/treat MSW.

Table 8-8
Oxalor System

Program	Collection (per ton)	Processing/ Disposal (per ton)	Total Cost (per ton)	Tot al Tons	Annual Cost
Residential					
Refuse	$83	$53	$136	24,633	$3,350,088
Subtotal				24,633	$3,350,088
Commercial					
Refuse	$54	$53	$107	30,994	$3,316,358
Roll-off	$62	$53	$115	9,704	$1,115,960
Subtotal				40,698	$4,432,318
Total				65,331	$7,782,406

8.8 Key Findings and Recommendations

1. **Use of the Oxalor technology would represent a significant change to how solid waste is currently managed in the City.** There would likely be significant political, operational, and financial challenges to converting the current system to the Oxalor system.

2. **The Oxalor system is one of many alternative solid waste management technologies.** Other alternative technologies for consideration include but are not limited to anaerobic digestion, gasification, source separated composting, waste-to-energy. Some of these technologies are currently being utilized domestically, unlike the Oxalor technology. If the City decides to pursue an alternative technology, R. W. Beck would recommend that the City conduct a more comprehensive review of all of the available options in order to determine which technology is most appropriate for the City.

3. **The Oxalor system would increase the City's solid waste management costs.** Based on R. W. Beck's financial analysis, the cost per ton to process MSW using the Oxalor system is $53, which is more than twice the current cost of disposal of approximately $24 per ton. The City would achieve some cost savings associated with discontinuing its composting and recycling collection programs; however, these cost savings would not be enough to offset the cost increase of using the Oxalor system. In addition, without any commercially operating reference facilities, it is possible that the projected costs to develop and operate a facility are understated.

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Appendix A

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Appendix A

Photos of the City of Fayetteville Material Recovery Facility


S205
BELKIN

Appendix B

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MEMORANDUM

To: [NAME]

From: Scott Pasternak & Katie Wussow, R. W. Beck

Subject: Interview Questions

Date: [DATE]

Thank you for your participation in this effort for the City of Fayetteville. We would emphasize that interview discussions will be kept confidential. All interview responses will be aggregated before being presented to the City. Listed below are the questions that we would expect to discuss during the interview.

1. What interest would your company have in either expanding existing or developing a new MRF in Fayetteville?
2. Please describe your experience with the processing of dual and single stream recyclable materials. For what other communities are you providing recycling processing services?
3. What challenges have you experienced or do you envision when processing single stream collected materials as compared to dual stream collected materials? How have you or what do you plan to do to overcome these processing challenges?
4. In its current program, Fayetteville recycles the following commodities: aluminum cans, steel cans, plastic bottles #1-2, glass beverage containers (green, clear, and brown), newspaper, OCC, and chipboard.
    a. How effective would you be in sorting this variety of materials?
    b. Would you be able to allow any additional materials not listed here?
    c. Would you be willing to accept and process glass?
5. What do you anticipate as an achievable range for the percentage of process residuals by weight utilizing dual and single stream processing technology?
6. If the City of Fayetteville chooses to initiate a competitive process to procure processing services, what type of project structure would you prefer?
7. Would you submit a proposal as part of a competitive procurement process requesting design build and operations services for a MRF located on City-owned property?
8. Would you submit a proposal as a part of competitive procurement process to operate a publicly owned MRF?
9. Would your firm be able to offer recyclable materials processing services to the City through your own facility or an alternative means? If so, when?
10. If the City were to issue an RFI for the development of a new MRF, how long would it take (after the approval was given to proceed) to have an operational facility?

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11. What do you see as the optimal approach to a public/private partnership for the City in implementing a recyclable materials program?
12. How is the pricing for the sale of recovered materials in this region of the U.S., as compared to other regions?
13. How much material would you believe would need to be brought to the facility on a daily basis to allow it to operate in an efficient manner?
14. Approximately how much material would your company expect to bring to the facility?
15. Are there any other creative ideas that you have concerning the development of a partnership with the City that you would be willing to discuss?